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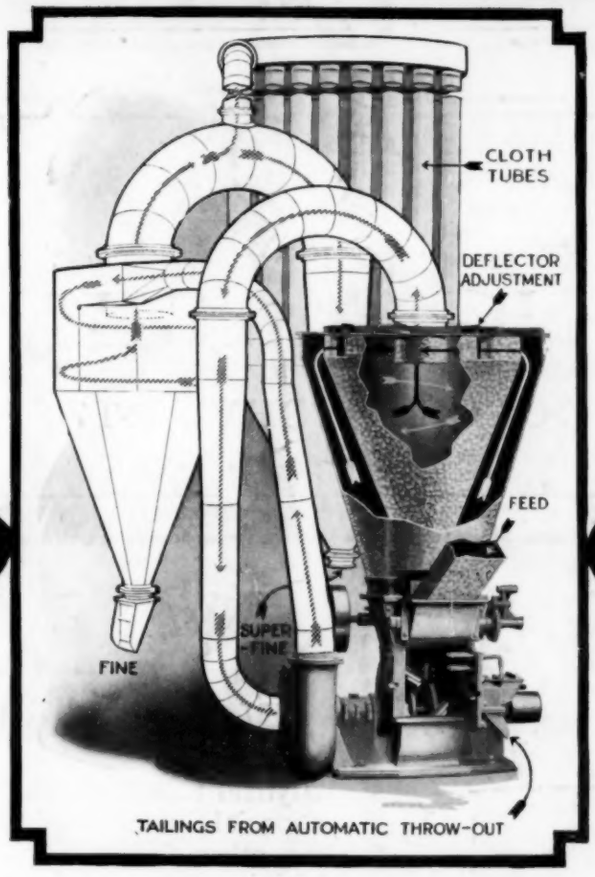
CHEMICAL & METALLURGICAL ENGINEERING



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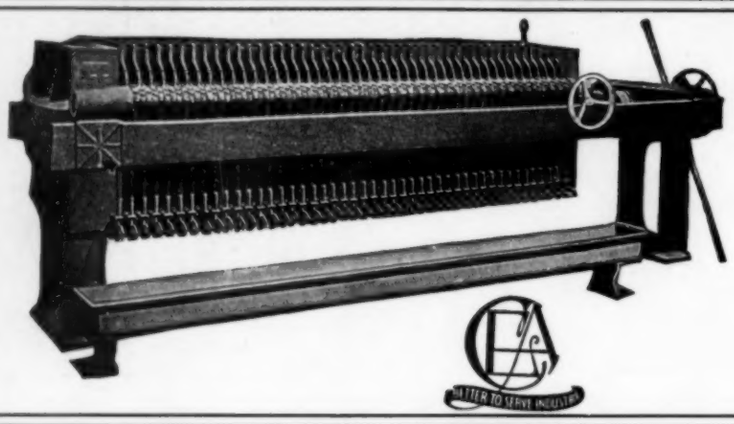

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H. C. PARMELEE, Editor

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Industry's Interest In Engineering Education

IN SPITE of the occasional, but widely heralded, antagonistic attitude of a few American business men toward college graduates, evidence is accumulating that, at least as far as engineering graduates are concerned, industry in this country is beginning to realize the value of college training. Apparently industry as a whole, but particularly that built on a technical or mechanical foundation, is beginning to wake up to a situation that has been appreciated for some years past by the two largest electrical manufacturers in this country. The latest tangible evidence of interest in the subject is Special Report 25 of the National Industrial Conference Board prepared by an advisory joint committee of industrialists and educators in engineering schools. The purpose of the report is "to show clearly the interrelationship between the engineering schools and the industries and the need for co-operation of the two organizations interested in the development and successful functioning of leadership in industry."

The report is a frank recognition of the value of engineering training in developing leadership in all branches of industry. And since this is true in spite of the fact that in the past there has been little or no co-operation between industry and engineering education, we can see still greater recognition for the engineer when industry makes known its wants and education tries to meet them as far as possible. What has already been achieved is a great tribute to engineering education, but the future holds promise of still greater things.

Based on the United States census for 1920, the report shows that of the 41,600,000 persons who were gainfully employed, less than 4 per cent planned the activities and directed the energies of the whole working force. In other words, 1½ million people acted as administrators, supervisors and technical experts for 40 million workers. Looking to the future, the report shows that under the normal increase in population, we shall have about 50,000,000 persons gainfully employed in 1930, requiring about 1,900,000 administrators and industrial leaders. This means that in the present decade, 1920-1930, we shall need to discover 400,000 new industrial leaders in addition to the needed replacements.

Against these figures showing the demand for men qualified to fill positions of leadership and responsibility is the fact that the total number of engineering graduates in this country is only about 70,000, while our engineering schools are turning out at the present time only about 9,000 graduates a year, many of whom do not enter industrial work. The supply therefore, assuming that engineering graduates have been found best qualified to fill the higher positions, is far from adequate, and certainly indicates that there is no overproduction of engineers.

If, as the report states, "the future of the country depends upon an adequate supply of men trained in applied science and engineering who are forward-looking men," it behooves us to look well to engineering education and particularly to the selection of those men who enter engineering schools. In this connection the preparatory schools can render a great service by selecting the potential engineers in their student bodies and guiding them toward the study of engineering subjects. And if high quality is to be maintained, it will devolve upon the engineering schools to set up such standards of admission as will exclude the unfit. Such selection combined with a broad and thorough training in the fundamentals of science, mathematics and engineering will go a long way toward meeting the apparent demand that exists in industry for leadership by trained engineers.

An Indictment Of the Technical Man

IS IT TRUE that the technical man is the last to recognize a significant achievement in technology? Lately it has been our privilege to listen to two distinguished critics of the technical man, and, strange to say, this was the point in common in their criticism. Charles F. Kettering in his informal talk before the American Electrochemical Society is reported to have said: "Any industry—more particularly its technical men—will accept anything new provided it is like what they've been getting before." Of course this statement was laughed down by the electrochemists along with the other sparkling products of the speaker's wit, but it had enough truth in it to keep it from being forgotten.

Our second critic was an influential manufacturer of electrochemical products. Although himself an executive rather than a technical man, he has become a prominent figure at the conventions of some of our technical societies. He is an enthusiastic listener at symposiums and theoretical discussions that would seem to bewilder and discourage the average layman. It was for this reason that we asked him for the underlying philosophy of his methods. Why was it he did not send his chemist or engineer to abstract and interpret the technical papers for him? His answer was simply that it had been his experience to find the average technical man entirely too skeptical of his fellow scientists and more often than not inclined to deprecate their accomplishments. In addition, there is the purely human trait that makes the technical man hesitate before going to his employer and telling him that a man on the technical staff of a competitor has worked out the solution of a difficult problem that might be applied to their own plant. These reasons prompted the manufacturer to investigate for himself; and his early results were so satisfying that he has since

formed the habit of accompanying his technical men whenever they go to their conventions.

This experience of the chemical manufacturer and broadside from Mr. Kettering are something of an indictment of the technical man. They point to a degree of self-sufficiency in his makeup that should be recognized and corrected. The underlying difficulty, as we see it, comes from a narrowed viewpoint that is likely to result from specialization within a limited field. What is needed is a broad view of the problems of the industry as a whole and the realization that after all technology is but a single important unit that must be carefully co-ordinated so that it will work for the success of the entire industrial machine.

Problems of Flexible Tariff Making

TWENTY or more years ago the Interstate Commerce Commission in its study of railroad freight rates was in about the same position as is occupied today by the Tariff Commission in its investigation of flexible tariff rates. There is a very limited legislative basis upon which the Tariff Commission can build. It is restricted by as many legislative enactments as are afforded for its aid and guidance. It has practically no precedent on which to go and absolutely no court decisions to define precisely the significance and interpretation that must be placed upon the limited existing law. Under these conditions it is obvious that any rapid strides toward adoption of new tariff rates under the flexible tariff law cannot be expected.

In the first place, in the study of any flexible tariff rate the question arises as to the constitutionality of the delegation of tariff-making power from the legislative to the executive branch of the government. Until that question is clearly settled by the United States Supreme Court all decisions under the law will, of course, be somewhat in question. It is more than likely that the present case on rates for linseed oil will be used as a test case to determine the general status of the law. Foreign costs of production of linseed oil have been determined by the commission and it is now investigating domestic costs. There seems to be no reason why a clean-cut case on this basic issue cannot be made of this particular item; and if it is determined by the highest tribunal of the land that flexible tariff rates fixed by the President on the advice of the commission are to stand, then the other questions of a more detailed and more technical sort will arise.

One of the first of these technical questions will be regarding the definition of "production costs," which under the law must be used to determine increases or decreases from the base rates fixed by Congress. The case of the appeal for change of rates on casein affords an excellent example on which test may well be made of this point. It is a question of cost keeping, or perhaps better called bookkeeping, as to what shall be regarded as the cost of skimmed milk. The costs in the United States and abroad for conversion of skimmed milk to casein are substantially the same. Therefore the merit of any appeal for increased or decreased tariff on casein hinges on what shall be regarded as the cost of the skimmed milk.

An equally troublesome question arises in connection with all commodities for which exact determination of foreign costs is not possible. Is the commission to be allowed to use its judgment in connection with the best available information when actual foreign costs are not known? This is a question on which the courts must pass. In the case of sodium nitrite, another pending issue before the commission, the domestic producers under the pledge of secrecy reveal their cost to the commission; but the foreign producers decline absolutely to furnish costs, although insisting that the domestic costs must be made available to them for rebuttal and refutation. The commission can by inference from prices and other conditions known to exist abroad fix what in its judgment is the foreign cost; but this is an inferential rather than an actual determination. The question is a serious one as to whether the commission may use such inferential costs in its findings.

These are but a few of the basic and difficult issues remaining for settlement before the flexible tariff law can become of full service to industry. But they are enough, and more, to show that progress must be made slowly if the damage from the use of the flexible tariff provisions is not to be greater than any potential benefit. Perhaps the next Congress will find it desirable to increase the effectiveness of the work of the commission by taking still further steps toward scientific tariff making; but in any event it will be the rulings of the Supreme Court of the United States that must ultimately be used as guideposts to permanent progress.

The Arc Process For Nitrogen Fixation

THE hearings before the Tariff Commission on the requested change in the rate on sodium nitrite have developed information regarding the arc process for nitrogen fixation under American conditions. This process is at present being used in this country only by the American Nitrogen Products Co., of Seattle, Wash., which is the concern requesting this amendment of tariff rates. The information which it submits to the commission has not been made public, as the costs presented are regarded as under the classification of trade secrets and are, therefore, being retained as confidential. But the public hearings, on which *Chem. & Met.* has already carried news reports, disclose sufficient information regarding the arc process to make an interesting interpretation possible.

The experience of the American Nitrogen Products Co. corroborates Norwegian experience that with sufficiently low-cost power it would be feasible to fix atmospheric nitrogen by the arc process at a profit. But a consideration of conditions throughout the United States quickly discloses the supplemental fact that there is no large quantity of power available at sufficiently low rates to make the arc process financially attractive. We must expect, therefore, that this process will find its profitable applications only in a few favored localities in the production of concentrated nitric acid, calcium nitrate, sodium nitrate, ammonium nitrate, sodium nitrite or other related compounds for chemical rather than for fertilizer uses, except perhaps in the case of calcium nitrate. It is certainly out of the question for the arc process to be extended widely in making nitrogen compounds for fertilizer use.

Norwegian power has been developed at exceptionally low cost and is generally available at prices not to exceed $5 per horsepower-year even at normal rates of exchange. These facts have been brought out clearly by the recent investigations of Tariff Commission experts studying the nitrite situation. Even under the most favorable American conditions $5 per horsepower-year is the very minimum that can be expected and the

localities where such low power rates prevail are invariably at such disadvantage because of high freight rates to the markets for their products as to offset the advantage of the lower power cost.

The situation near Seattle is peculiarly favorable for cheap power development and there may be some further expansion of the arc process in that territory. But under no circumstances need one look forward to general development of the arc process elsewhere.

An Opportunity For the Small College

ANNOUNCEMENT is made by most of the older universities of the country that they have reached the saturation point in number of students with their present equipment. Accordingly many young men have been excluded from the present freshman class. The method varies in determining to whom these doors of learning shall swing open, but that most commonly adopted is to accept those with highest standing in their high school studies or entrance examinations.

We might discourse at length on whether this method really selects those that will get the most out of a college education, particularly in engineering or science, or those that will make the best use of it in after life, but we shall reserve that for future discussion. The line had to be drawn somewhere and probably this method works as little injustice as any other.

One result will be the dissipation of the idea that because Father went to Yale or Harvard or Princeton, Son must go there too. That was rather easy in the old days, but now Son must show considerably more than inclination to spend 4 years acquiring "culture" with a modicum of effort. He must keep up with the procession or make room for another.

However, the youths that are shut out of the older universities need not despair. They may be denied admission to the institution of their first choice, but this may really be a blessing. The smaller colleges and universities offer advantages that many consider outweigh those of the older and larger institutions. They now have an opportunity to prove it.

The Art of Thinking In Science

IN HAVELOCK ELLIS' supremely interesting book called "The Dance of Life" he postulates Art, in its larger sense, as the beginning and, indeed, the fulfillment of things, as the foundation of progress in life. In the chapter on The Art of Thinking, he emphasizes the artistic and rythmical groundwork of physical science, and he tells how every really great chemist and physicist is, *eo ipso*, an artist; that he must be such to achieve his mighty vision. By a curious coincidence Ellis' theory is made manifest in Professor Soddy's address before the Royal Institution last May, almost as though the lecture were an appendix to the book. Soddy's subject was "The Origins and Conceptions of Isotopes" and the exposition is built up, piece by piece, as a great master would have designed and built a beautiful temple in the golden age of Greece. "I venture to think," says he, "that no more elegant extension of our methods of gaining new knowledge has ever been obtained than that which, in due course, was to reveal the existence of isotopes."

The steps are many and varied, but they take on this quasi-architectural quality as soon as they are coordinated. Early in the essay he states that "the analysis of the constituents of matter, which we were born and brought up to regard as the most searching and fundamental, is an analysis by means of chemical properties." Then followed spectroscopic analysis, which "merely dotted the i's and crossed the t's of chemical analysis, filled in a few vacant places of the periodic law and handed the newcomers over to the chemist." Later came radioactive analysis, which was found applicable only to the radioactive elements, but even so, here was discovered "as fine a hallmark of identity as any of the 'tests' of chemical analysis." But note, please, that the chemical character of an element is what might be called its "existence properties," whereas "the radioactive character is that attending the explosion of an atom which terminates the existence of the element as such." None of this was known during the earlier days of radio-chemistry.

Anyone who fails to see the clear beauty and the consummate art in Professor Soddy's presentation of this subject is in a bad way. His imagination is going back on him. And without imagination, all is lost to those who think in terms of chemistry and deal with its engineering applications.

Quality of Paint Pigments

SPEAKING of ocher, the Tariff Commission in one of its reports says: "The imported product is as a rule of higher quality than the domestic. The domestic ocher could be made equal in quality to the French by proper care in preparation. . . . A certain quantity of French ocher will be imported regardless of tariff duties because of its superiority over the domestic product. Domestic resources are ample to supply requirements of the cheaper grades."

There is something of an indictment of our domestic ocher producers in this brief statement. But there is also an important point in paint technology which is far too often ignored even by paint manufacturers themselves. This is the necessity of maintaining uniformity of pigment, both as to physical and chemical characteristics, in order to preserve uniformity in ready-mixed or paste paints.

The purchaser of domestic ocher soon learns that with every new lot purchased even under definite specifications he has to study his paint formula carefully to see whether or not some modification in proportions of vehicle, oil, filler and other constituents is necessary to maintain exact uniformity in color, consistency and covering qualities. It is not strange, therefore, that the paint manufacturer will choose other sources of ocher, which promise and actually deliver material of such uniformity as to eliminate the necessity of such care with each new lot.

The French producer may at some points have better raw material with which to work. But the American producer has amply good raw material to permit manufacture of the first-grade product uniformly and regularly over long periods. Perhaps the American producer will say that it does not pay to take the care to make the finer grades, but this is not a satisfactory explanation. Domestic ocher manufacturers with ingenuity and careful study can certainly develop sufficiently efficient methods to meet the foreign producer on his own ground as to quality and still find the supply of the best, as well as the lower grades, a profitable business proposition.

Shawinigan Falls

The Realization of an Industrial Ideal

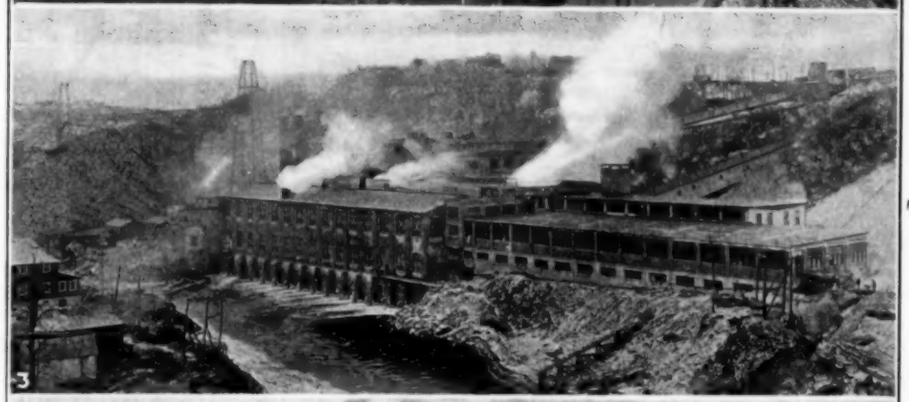
1—Canada Carbide Co. This plant, just up river from the chemical company, supplies the acetylene for that concern's process, in addition to most of the calcium carbide used in eastern Canada.

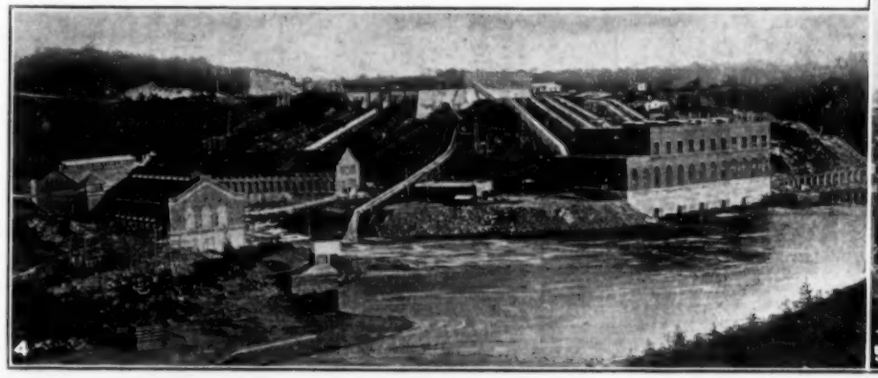
2—Northern Aluminum Co. To the left can be seen the power line coming from the companies' private power houses and also from the Shawinigan Water & Power Co.

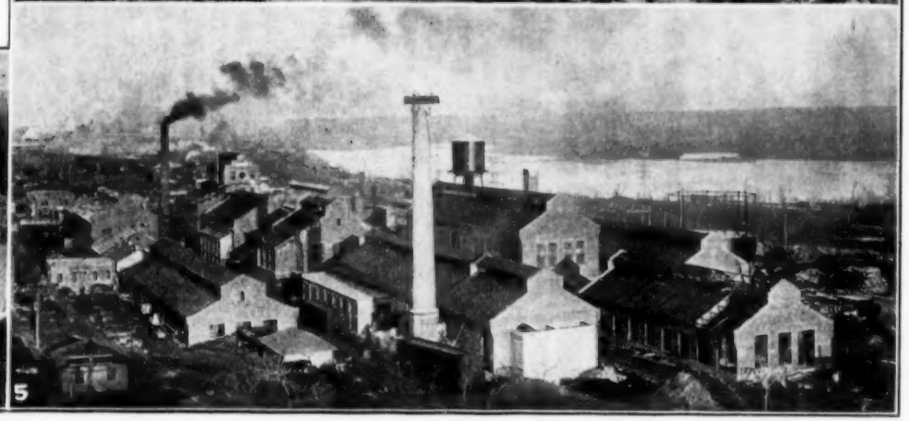
3—Belgo-Canadian Pulp & Paper Co. Mill in the foreground, with the pulpwood pile and some residences in the background.

4—Shawinigan Water & Power Co., showing the gate houses at top of slope and the power houses below, connected by concrete penstocks.

5—Canadian Electro-Products Co. Picture taken on Armistice Day. Note the St. Maurice River above the falls in the background, with the transmission line from the Laurentide Power Co. at Grand Mere.







What Hydro-Electric Developments Mean to Industry

IN THESE days of ever larger and more congested cities, the decentralization of industry is looked to by many as the ideal solution of our industrial problems. These would be solved if our industries were split up into smaller units and were located in small towns or villages. It is thought that people would then lead a more healthful and contented life and would not be shut off from proper recreation facilities.

There is a tendency toward such decentralization latent in the development of hydro-electric power generation. The primary purpose of most such developments is to supply current for public utilities. But there is generally a surplus over the public utility demand which can be used for manufacturing purposes.

Some hold that all of this hydro-electric power will soon be needed and used for public utilities. This is not entirely true. Many of the larger of the new developments will undoubtedly sell most of their power for public service. But there are scores of smaller locations which are distant enough from great centers to enable an industry locating there to compete with the public utilities in purchasing power. When such power sites are not too far from the market and from good transportation, they will undoubtedly form the basis of future industrial towns.

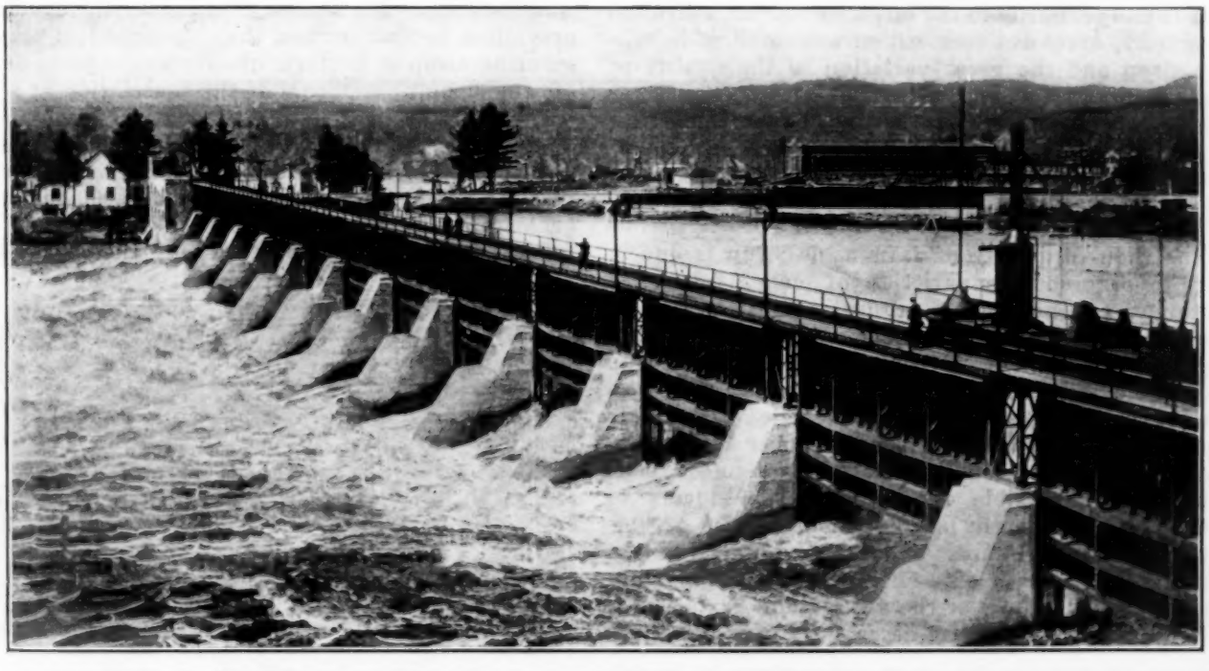
An example of how this works out in even a fairly large waterpower development is furnished by Shawinigan Falls, Que., Canada. At this site the head is 150 ft. and is utilized to develop 195,000 hp. by the Shawinigan Water & Power Co. and 40,000 hp. by the Northern Aluminum Co. About half the former is transmitted to Montreal. The remainder has served as the basis upon which a number of industrial plants have been established, and these plants and the community which has grown up about them give a good idea as to what may be expected if this type of development spreads.

Perhaps the most interesting of the plants is that of the Canadian Electro Products Co. This concern produces acetic acid as a main product, and such other chemicals as paraldehyde, acetic anhydride, acetaldehyde and butyric acid, which can be made from acetic acid or are byproducts of the process. Starting with acetylene, which is supplied from a neighboring plant, acetic acid is synthesized by a catalytic process. At the present time the plant is shipping upward of 1,500,000 lb. of this product per month.

The Canada Carbide Co. manufactures calcium carbide and acetylene. This plant has been adapted to the use of the materials which can be obtained in the locality—native limestone and gas-works coke. From these materials are manufactured first-quality calcium carbide in all the usual commercial sizes. In addition, acetylene is manufactured in a large generating plant—one of the largest in existence—and supplied to the local branch of the Prest-O-Lite Co. and to the Canadian Electro Products Co.

Another very fine plant located at Shawinigan Falls is that of the Belgo Canadian Pulp & Paper Co. This plant is one of the largest producers of newsprint in existence. This mill is notable for the care with which scientific control is applied to the process and for the alert engineering talent which quickly takes advantage of each new development in paper technology. Perhaps the most interesting feature is the largest newsprint machine in the world, 233 in. wide and—running at 800 ft. per minute—producing 100 tons of newsprint per day.

But interesting as the various manufacturing plants at Shawinigan Falls are, the most interesting thing to the visitor is the community itself. Well-paved streets, good schools, including a technical institute, and several churches indicate, as do the high quality of housing, a prosperous and contented working population. The town has about reached its limit of growth, as the available power for industrial use is all taken up. So the present conditions of plenty of work and plenty of space for all stand a good chance of being preserved and Shawinigan Falls will remain, as it is today, an ideal industrial community.



How Chemical Engineering Helps the Maker of Cane Sirup *Improve his Production*

Construction and Operating Methods of Novel Plant Designed by Bureau of Chemistry for Texas Farm Bureau Federation, in Which Good Engineering Replaces Crude Farm Methods

BY H. S. PAINE* AND R. S. MCBRIDE†

CHEMICAL ENGINEERING IN INDUSTRY

SUGAR CANE in the continental United States is utilized in about equal amounts for the manufacture of cane sirup and of sugar. The total amount of cane sirup made annually in the United States is about 40,000,000 gal.; it is, therefore, an important agricultural crop in a large portion of the South. Moreover, it is a cash crop upon which farmers depend to a great extent for ready money in the fall, and is also advantageous from the standpoint of labor, since the harvesting of the cane and manufacture of the sirup take place in November and December, when farm labor is not greatly needed for other purposes and can well be utilized in this manner.

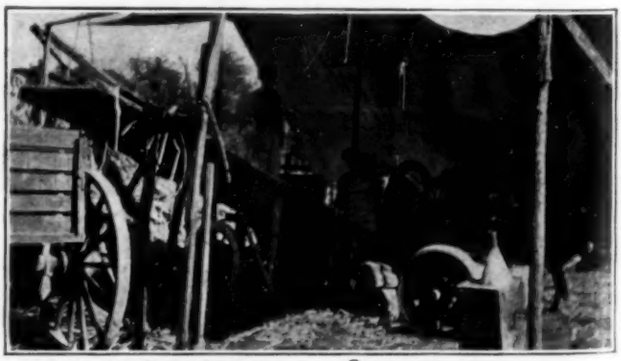
A large proportion of sugar-cane growers would gladly increase their acreage of sugar cane for sirup if the market could be so stabilized as to make possible a reasonably certain and fair return. Unfortunately, however, conditions for marketing cane sirup have been more or less chaotic and the selling situation has been unorganized from the standpoint of the producer. Prices have varied greatly, even in adjacent counties, and have fluctuated to a great extent from one period of the year to another. This condition is due primarily to the large number of individual producers, excessive competition among them in selling sirup and the great variation in the quality of their product. Moreover, farm-made sirup in "buckets" has been and continues to be the biggest competitor of the products of uniform quality offered to the market by the larger manufacturers and packers.

QUALITY A LARGE FACTOR IN MARKETING

Variation in quality of farm-made sirup is due in part to difference in varieties of cane, degree of maturity, soil and other cultural conditions, but is also greatly influenced by the varying equipment, methods and skill employed in manufacturing sirup from cane juice. In fact, cane sirup has varied so greatly in quality from one small-scale producer to another, and even with the same producer at different periods of the season, that it has heretofore been practically impossible for cane-sirup producers to assemble a sufficiently large volume of sirup of uniform quality to interest regular commercial trade. This refers primarily only to the "farm-made sirup in buckets" type. Much of the sirup made has sugared badly, cans being in some cases a third or more full of sugar. Furthermore, "farm-made" sirup has had a bad reputation, owing to unreliability in quality and, in many cases, to the careless and even slovenly manner in which it has been made, handled and packed. In the spring of 1922 the Texas Farm Bureau Federation undertook to remedy this condition by organizing a cane-sirup association for the purpose of co-operative marketing of this article. However, no procedure had been worked out for handling the technological phases of the matter—i.e., treatment and handling of the sirup at a central, co-operative plant in order to secure uniform grades of acceptable quality. The proper solution of the chemical and technological phases was, therefore, the key to the situation, and it was useless to consider primarily marketing features until these had been solved. The federation therefore requested the Bureau of Chemistry to undertake to work out of this aspect of the matter, and co-operation to this end was accordingly arranged.

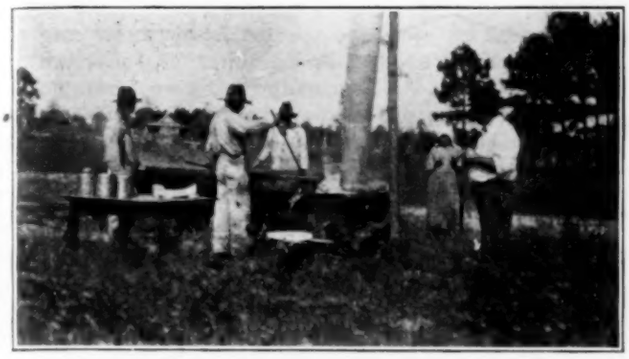
BUREAU OF CHEMISTRY TACKLES PROBLEM

After examining the situation in east Texas (which is the cane-sirup producing section of the state), it was decided by the bureau that, under the conditions prevailing in that section, the only practical plan for securing sirup of uniform quality would be to assemble the sirup of members of the association at a central plant, where it could be graded and consignments of the same grade mixed on a sufficiently large scale to insure uniformity of each grade. It was determined that the mixing of the sirup in lots of 5,000 gal. would be amply sufficient to secure such uniformity. The federation thereupon proceeded with the organization

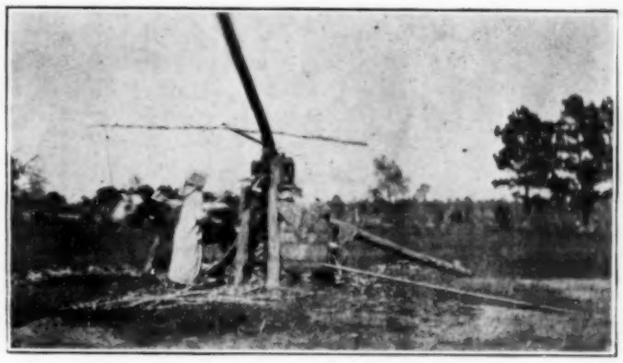


CANE MILL OF TYPICAL SIRUP PLANT
Showing slide for delivery of cane from wagon to cane mill

*Bureau of Chemistry, Department of Agriculture, Washington, D. C.
†Assistant Editor, *Chem. & Met.*



TYPICAL EVAPORATOR FOR FARM USE



CANE MILL OF A MORE PRIMITIVE SIRUP PLANT

of the co-operative association according to the plans of organization and financing employed by it in the case of other commodity organizations.

The Bureau of Chemistry devised the process to be employed at this central plant, which was located at Lufkin, Tex., prepared working blueprints showing details of construction of the plant, drew up specifications for all equipment required, and subsequently supervised the construction of the building, installation of equipment and operation of the plant. The plant was designed for a maximum capacity of 5,000 gal. of sirup per 12-hour day; thus in a 100-day season, the plant could, if desired, handle as much as 500,000 gal. of sirup. Approximately 90 per cent of the sirup received at the plant was shipped by rail, a refining in transit freight rate being secured. The process devised by the bureau for handling and treating the sirup was as follows:

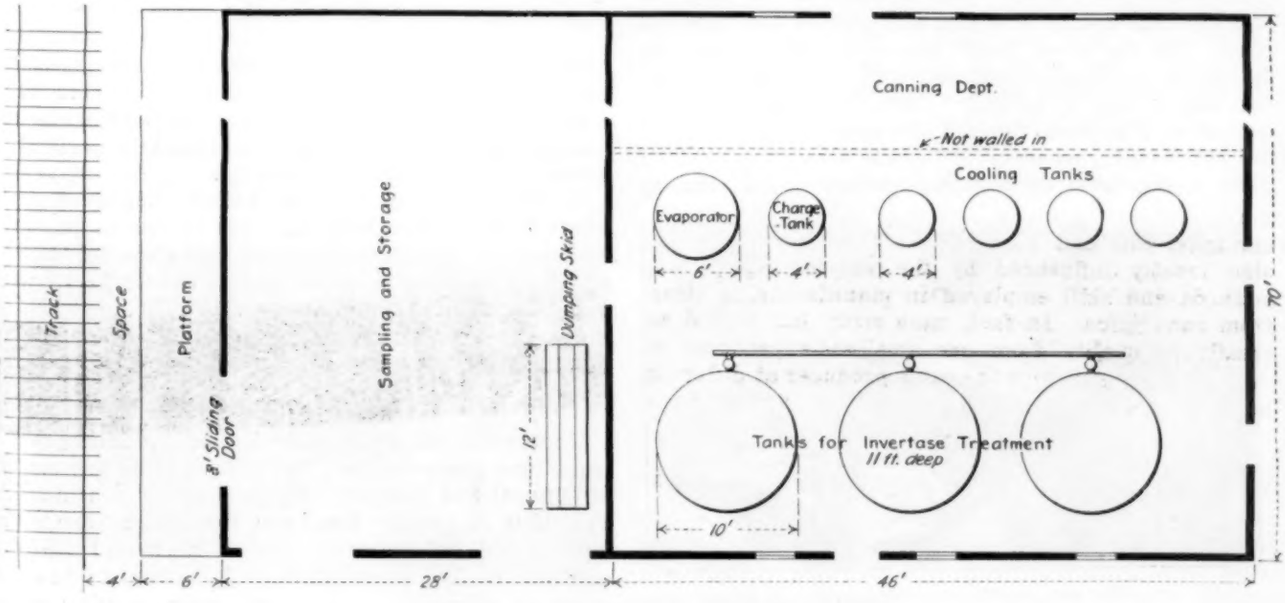
New Process Developed

The sirup was graded, upon receipt, in barrels into two grades, one of light color and high quality and the other of darker color and lower quality. Density, color, flavor and clarity were considered in determining grade. After emptying the barrels and steaming them out thoroughly on a dumping skid, the sirup was pumped to one of the mixing and inverting tanks. A much longer time for steaming was required when barrels contained sugar.

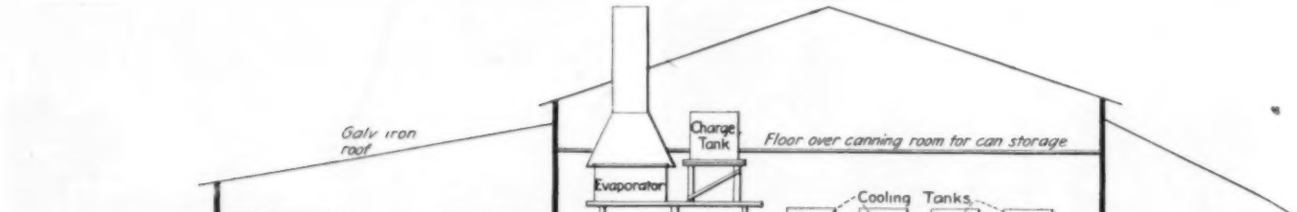
One of three insulated steel tanks, of 5,000 gal. capacity each, was filled each day from barrels of sirup of the same grade, and then treated by the invertase process devised by the Bureau of Chemistry for preventing subsequent crystallization in the cans. In order to limit the cost for the invertase treatment to ½c. per gal. of sirup, the time period allowed for the action of the invertase was increased to 36 hours, and it was planned when working regularly and to capacity to use the three tanks in cycles of this length each, one tank being filled with sirup each day and another tank being emptied. These tanks served, therefore, both as containers for mixing the sirup on a sufficiently large scale to insure uniformity and as containing vessels for the invertase treatment.

When the invertase treatment was completed, the sirup was pumped to an open steam evaporator, which served as a processing kettle to heat the sirup before canning and also as a means of evaporating the sirup to uniform density when required. From the evaporator the sirup passed through an ordinary cheese cloth strainer and thence by gravity to a battery of cooling tanks, where it was cooled to the required canning temperature, the latter varying according to the size of the can being filled. The sirup then flowed by gravity to the canning department of the plant, where it was delivered by means of an automatic sirup filler into cans, the latter being then sealed, labeled and crated.

The building was equipped with a can loft for hold-



FLOOR PLAN, CENTRAL SIRUP PLANT



SIDE ELEVATION, CENTRAL SIRUP PLANT

ing a reserve supply of cans, and sufficient storage space was provided for a reasonable amount of incoming sirup in barrels and outgoing sirup in cases. The plant was built on a railroad siding. A boiler of suitable horsepower for providing steam for the plant was installed in a suitable boiler shed.

The general arrangement of the building is such as to permit considerable flexibility in the handling of the sirup. Thus the receiving shed is large enough to permit the accumulation of several hundred barrels of sirup. At times when sirup is not coming in rapidly, more or less of this space can be used for holding finished sirup in cans ready for shipment. The inverting tanks together hold at least 3 days' supply of sirup, while ample storage space for cans and cases and ample floor space for the canning operations is provided by the loft and canning room.

The basic ideas were to keep the process of standardizing sirup as simple as possible, to have all equipment strongly made so as to give reliable service, and so constructed and operated that with reasonable care the sirup would not be damaged in any way by the treatment.

Low-Grade Sirup Blending

The handling of low-grade sirup presented a problem of some difficulty. It was considered good business policy for the first year at least not to limit too closely the quality of sirup accepted by the association. On the other hand, the association could not afford to be unduly burdened with a low-grade product that would be difficult to sell. This problem was solved by a process, devised and installed temporarily by the bureau, whereby low-grade sirup was treated with a vegetable decolorizing carbon which reduced the color of this low-grade sirup to that of the high-grade sirup. A certain amount of flavor was also removed, but it was possible after this procedure to mix the treated low-grade sirup on a 15 to 20 per cent basis with the first-grade sirup, without in any manner affecting the quality of the mixture as compared with regular first-grade sirup. The cost of this treatment was found to be justified by the increased value of the low-grade sirup and the advantage of having only one standard grade to market. The difference in price between low-grade and high-grade sirup which the association returned to its members was, therefore, determined by the cost of this treatment. Although very satisfactory under the circumstances, it has not as yet been definitely decided to adopt this procedure permanently.

CANE SIRUP EVAPORATOR
Showing the sloping surface formed by the foam of the boiling sirup.

GENERAL VIEW OF SIRUP GRADING PLANT, LUFKIN, TEX.
Office shown at right, boiler house at left

In devising the entire plant process employed, every effort was made to keep all costs as low as possible. The cost of the plant complete was close to $12,000, which is considered quite modest as compared with a maximum of approximately $400,000 to $450,000 gross value of sirup which the plant is capable of handling per season.

Technical Success Assured

The operation of the central plant according to the procedure above outlined has proved to be technically an unqualified success. Sirup showing considerable variation in quality has been received at the plant and turned out as one grade of high and uniform quality. Badly sugared sirup was converted into clear sirup of attractive appearance which contained no sugar crystals and which also would not crystallize

in the can or on standing after being removed from the can. Samples from various lots of sirup run through the plant during successive periods of the season were practically identical. A large number of samples of cane sirup found on the market in Texas were secured and compared with the sirup produced at the Lufkin plant. The latter was found to be superior to most of these from the general standpoint of uniformity of quality, flavor, lightness of color and freedom from sugaring. It is believed, therefore, that the problem of converting a miscellaneous lot of farm-made sirup of widely varying character into marketable uniform grades of high quality and free from the objections which have been made to farm-made sirup in the past has now been solved.

Financial Results Yet to Be Determined

The successful operation of this enterprise from a business standpoint has been handicapped during the first season by certain inadequacies of experience. Such deficiencies in the initial stages of operation are no doubt to be expected in the case of co-operative associations undertaking rather specialized merchandising enterprises such as the selling of sirup. It is evidently of paramount importance in such enterprises that efforts toward economy should not be carried to such a point as to interfere with securing competent management.

Conduct of the enterprise was at first also handicapped by lack of confidence, due to the failure in the same territory of other commodity marketing associations. The plant started operation late in the season, and did not finish handling sirup until the last of March, 1923. The total amount of sirup received was 60,000 gal. Owing to delay in getting the plant constructed and in operation, complete returns from the sales of sirup are not available, so that a complete financial statement of the year's operation cannot be given.

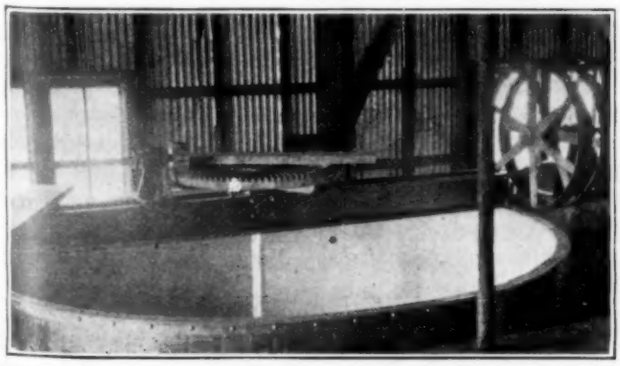
The co-operative association is a non-profit organization and all surplus funds, except such as may be required to cover replacements, certain types of depreciation, etc., are to be distributed to the members of the association after all sirup is sold. An advance payment which was made to members immediately upon delivery of the sirup to the central plant was financed by a loan secured by warehouse receipts. Further payment to members may be made pro rata upon amount of sirup delivered to the plant as soon as the financial statement can be issued.

Since accounts for the season have not been closed, it is impossible at this time to determine what further payment will be made and the amount, therefore, of the total return per gallon. In spite of some serious losses due to inexperience and the increased overhead expense due to the fact that the amount of sirup received by the plant was considerably less than its capacity, it is believed that the total return made to members during the first year of operation should somewhat exceed that received by non-members. Furthermore, many non-members still have a quantity of farm-made sirup on hand for which there is at present little or no market. Toward the end of the season the association was solicited by a number of non-members to accept, for treatment by its plant process, considerable quantities of cane sirup which had been already canned by these non-members and which proved to be practically unsalable because of excessive sugaring. A certain amount was accepted and these producers joined the association.

EVAPORATOR AND EVAPORATOR COILS (NOT YET IN PLACE)

Further Development Likely

It has been established beyond any doubt that the total cost of operation per gallon of sirup is sufficiently low with reasonably good business management to fully justify and amply repay the enterprise. A careful analysis of costs has been made as compared with those of established commercial concerns in the sirup business, and there is no doubt whatever that with reasonably good management the co-operative association can make a satisfactory and attractive return to its members. By extending the movement to make sugar-cane sirup a standardized commodity throughout the South, it is believed that the co-operative associations working together with the sirup packers and distributors already established in business will find an increasingly better market.



ONE OF THE THREE LARGE INVERTING TANKS

To Prevent Stone Deterioration

Investigations are now under way at the Bureau of Standards covering the action of frost on building stone and on the value of colorless waterproofing materials with which to protect the surface of stone structures. Recently the series of exposure tests on colorless waterproofing materials, having for its object the determination of the relative durability of these treatments under weather conditions, has been supplemented by a series of tests to determine the efficiency of different waterproofing materials in preventing decay of the stone.

Crystallization tests are being made on waterproofed specimens of stone, as mentioned in the last bulletin, to secure a comparison between treated and untreated specimens. Waterproofed specimens have also been exposed to the weather and will be tested after a considerable period of exposure.

What Is the Real Cause of Water-Line Corrosion?

Investigation Indicates That Contact of Air With Surface of Liquid Is Not Responsible for This Phenomenon

BY KENNETH M. WATSON

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THE subject of water-line corrosion is one which has been of current interest to scientific investigators of corrosion problems for several years and has gained considerable attention from commercial sources, due to its destruction of valuable apparatus and materials in industry. Various theories have been advanced as to the causes of this phenomenon, but little actual experimental research is recorded as having been carried out in an attempt to gain definite information as to the causes and mechanism of the action. The work subsequently described in this paper was undertaken with the view in mind of testing the theories which are current among corrosion specialists and, if possible, of gathering additional information on the subject, which might be of value in understanding and combating the resulting effects of this sort of corrosion.

In this paper, presented at the general meeting of the American Electrochemical Society in September, is described a successful investigation of the cause of water-line corrosion. Results indicate that this phenomenon is caused by the slow downward flow of the heavier film of corrosion products along the surface of the metal, which draws in at the surface of the liquid a fresh supply of solution.

It might be well at this point to explain what is understood by the term "water-line corrosion." As the name would indicate, the expression refers in general to the severe, localized corrosion which is met with in the case of metals which are partly submerged in a slowly corrosive solution. This corrosion takes place over a narrow range at the point where the metal emerges from the liquid—that is, where air, metal and liquid are all in contact. The corrosion may take the form either of deep pitting, giving a result that resembles the work of a drill press, or of a clean cutting of the metal along a line, almost as though a saw had been used.

One of the first cases of water-line corrosion that was called to the attention of the author was that of the zinc electrode of an old sal ammoniac cell. The cell had been standing for some time without use, and on taking it apart it was noted that the zinc electrode, although for the most part in fairly good condition, was cut almost in two at a point corresponding to the water line of the solution. Other cases of severe water-line corrosion have been met in the condenser tubes of seagoing ships, where a serious commercial problem results. Further trouble of a more or less serious nature is constantly being encountered in laboratories and manufacturing concerns in the use of metal apparatus in corrosive solutions. A case recently brought up dealt with the failure of a common, galvanized hot water tank, such as is used in nearly every home, by deep pitting and general corrosion at the water line. Thus it is seen that the subject is one of practical importance, which merits careful attention in the study of the subject of corrosion in general.

One of the explanations of this effect, which has long been held as plausible, is based on the accelerating action which oxygen has on any form of corrosion. It is argued that, since oxygen can be absorbed from the air only at the surface of the liquid, it would be natural to expect that the concentration of oxygen dissolved would be higher at the surface and therefore corrosion would proceed most rapidly at that point. The fact is further pointed out that in most solutions there is a "creep" of the liquid up the sides of objects partly submerged in them. This would result in a thin film of solution over the metal, which would be in constant contact with the air and therefore probably almost saturated with oxygen, which, through its depolarizing action, would greatly accelerate corrosion at that point.

The effect of oxygen on the rate of corrosion is undeniable, and it is probable that the depolarizing effect of absorbed air has considerable to do with water-line corrosion as claimed in the above theory, especially in solutions where there is a marked tendency to "creep." However, careful studies of water-line effects produced in the laboratory have caused at least one author to disagree with this theory. In the fifth report to the corrosion committee of the Institute of Metals, by Guy D. Bengough, R. M. Jones and Ruth Pirret, the following statement is made:

"It is a familiar fact that an increased amount of corrosive action is liable to occur in the neighborhood of an air sea-water surface in contact with certain metals and alloys as compared with that of the immersed portions of the same materials. It is usually supposed that such increased action occurs at or just below the water line, and that it is due to the depolarizing action of the air whereby electrolytic action is greatly stimulated. A little investigation, however, soon shows that it is by no means as simple as would be expected on this view . . . It soon became clear that the greater part of the increased corrosive action did not usually occur at the water line, but above it, and sometimes considerably above it—e.g., as much as 2 cm. . . . The 'water-line' attack in neutral liquids may be considered as essentially a deposit type of attack and is set up because the conditions near the water line are favorable to the formation of harmful deposits from the products of corrosion; and the whole action is no doubt assisted by the oxidizing action of the air." (See *J. Inst. Metals*, vol. 23, p. 125.)

In a further discussion on the protection of condenser tubes, Mr. Bengough states: "As an instance of attack by corrosion products the well-known effect of preferential attack at a water line is an example. This is mainly dependent on the nature and distribution of the products of corrosion and is not, as is usually supposed, due principally to the depolarizing action of the air. Under certain conditions the products of corrosion may give rise to 'concentration cells,' which may give rise to very rapid pitting." (See *J. Inst. Metals*, vol. 26, p. 442.)

EXPERIMENTAL WORK STARTED

Because of the importance of the problem and the interest shown in it the following experimental work was undertaken in an attempt to straighten out the diversified theories that prevail at present, and to

Paper presented before the American Electrochemical Society, Dayton, Ohio, September, 1923.

gather additional information on the mechanism and effects of water-line corrosion.

The metal specimens used in the following experiments were for the most part cut from sheets of about 0.37 mm. thickness, the usual size being about 2.5x15 cm. These specimens were bent at right angles at a point about 3.75 cm. from one end and set in the solution in which they were to be tested, contained in ordinary tumblers. The bent-over end of each rested against the inner wall of the tumbler just below the top and served to keep the specimen in an upright position and away from the sides. The tumblers were filled with the solutions to within about 1.2 cm. of the top and in some cases connected to a Mariotte bottle to maintain constant levels. In the majority of the cases, however, the water that was lost from the solution was replaced by daily additions. The slight variation of water line did not appreciably affect the results as compared with those obtained when using the constant-level device.

In preliminary experiments it was found that when corrosion is accompanied by vigorous evolution of gas, as in the attack of zinc by dilute hydrochloric acid, water-line corrosion does not occur. The choice of corroding solutions was therefore limited to such as did not cause liberation of gas.

Samples of zinc were exposed in dilute hydrochloric acid and in solutions containing about 100 grams per liter of sodium chloride, potassium nitrate and ammonium nitrate, and also in a nearly saturated solution of calcium chloride. In the hydrochloric acid, as stated above, there was no evidence of water-line corrosion. There was no water-line corrosion in ammonium nitrate in 20 days, but under the layer of salt which covered the zinc for a distance of 2.5 cm. above the surface of the liquid the zinc was deeply pitted, and at the upper edge of this deposit the zinc was cut nearly in two. In the other solutions corrosion was so extremely slow that there was no noticeable effect at the end of the period of 3 months, to which the experiments were limited.

Results of Tests

After 8 days in normal hydrochloric acid sheet copper was corroded entirely in two at a point 1 mm. below the water line. Brass behaved similarly in a slightly longer time. In normal sulphuric acid corrosion of copper and brass was much slower than in hydrochloric acid, and, strange to relate, the maximum corrosion occurred 3 to 5 mm. above the water line, beneath crystals of metallic salts which had formed there through "creeping" of the solution. In 40 days holes were eaten entirely through the metal at that point. Exclusion of air by a layer of lubricating oil entirely stopped corrosion. In dilute hydrobromic acid water-line corrosion was well marked on copper in 10 days. In solutions of chromic, formic, acetic, phosphoric, fluoboric and fluosilicic acids corrosion was so slow that no results were obtained in the time available.

A narrow band of cheese cloth was tied tightly about the middle of sheets of brass and copper, and these were then placed in hydrochloric acid so that the cloth extended both above and below the water line. In 9 days specimens were cut entirely in two at both edges of the cloth, and also showed a deep cut at the water line, as well as general corrosion over the whole surface. When air was excluded by pouring on a film of oil, corrosion below and at the water line was stopped, but the sheet was severely corroded in the air at the top of the cloth. That air (or oxygen) is necessary for the corrosion of brass and copper in hydrochloric and sulphuric acids is amply confirmed by these experiments.

Sheets of copper were fastened to the bottom of tumblers which were filled with hydrochloric acid inverted in a larger dish of the same liquid, and supported above the bottom so that half of the tumbler was above the acid in the outer dish. Hydrogen was then passed into the tumbler until the liquid level was the same within as without the tumbler. Any air that reaches the copper must come in from below, and if water-line corrosion is due to a higher concentration of depolarizing air at the upper surface than throughout the main body of liquids, the most rapid corrosion in this case must take place at the bottom of the sheet of metal. At the end of 15 days the specimen was completely cut off at the water line. This establishes definitely that even where oxygen is necessary in order that any corrosion may take place, water-line corrosion is not due to any particular depolarizing action at the boundary surface between air and liquid.

Several experiments were tried in which the corrosion of copper in hydrochloric acid was stimulated by addition of an oxidizing agent to the liquid, instead of waiting for oxygen to be absorbed from the atmosphere. Both bromine and potassium bichromate were used as oxidizing agents, with the vessels open to the air, and also covered with a layer of oil. There was sharp water-line corrosion in every case, and access or exclusion of air seemed to be without effect.

True Explanation Suggested

The true explanation of water-line corrosion was suggested by a phenomenon frequently seen during the corrosion of metallic anodes by use of the electric current, where the dissolving of the metal creates a film of condenser solution next to the metal, which can be seen to flow down along the surface of the anode and stream off from its lower end. Water-line corrosion was thought to be due to a similar circulation which keeps all of the metal plate except that near the liquid surface in contact with partly exhausted solution, and causes the metal at the surface of the liquid to be bathed by the stream of fresh solution which is drawn in to take the place of that which flows downward along the metal surface.

To determine if such circulation actually takes place in cases of water-line corrosion a strip of copper was placed in a narrow stereopticon cell containing normal sulphuric acid, to which 50 grams per liter potassium bichromate had been added, and the progress of corrosion watched by transmitted light. In a few minutes the expected circulation was clearly visible, and a constant stream of corrosion products flowed down the specimen and off from its lower end. A slight flow across the surface of the solution to the copper was also detected. Similar examination of a strip of copper in dilute nitric acid showed quite different results. In this case there was a slight current flowing toward the metal at the bottom and then upward along the metal surface. This was caused by a slow evolution of gas at the surface of the metal, which acted like an air-lift pump and prevented the downward flow that would otherwise have taken place. Experiments not previously mentioned had shown that water-line corrosion of copper in dilute nitric acid does not occur, but while corrosion is fairly uniform, it is slightly greater at

the bottom than elsewhere. The reason for the failure to secure water-line corrosion of zinc in hydrochloric acid, mentioned earlier, is apparent.

Explanation Is Confirmed

The above view of the nature of water-line corrosion is confirmed by the following experiments: A narrow strip of copper was suspended in a solution of hydrochloric acid containing potassium bichromate, and an open glass tube was placed around it so that the tube dipped 2.55 cm. into the solution. In 2 days the copper was cut through, not at the liquid surface, but opposite the bottom of the tube. The same result was obtained in a longer time in hydrochloric acid, without any addition, but exposed to the air.

A sheet of copper was suspended in a tumbler so that half of it was above and half below a perforated paraffine disk, which extended horizontally across the tumbler, and the tumbler was filled with normal hydrochloric acid. In 8 days the regular water-line corrosion had taken place, and the specimen was cut through at the surface of the solution. On removing the remainder of the specimen from the solution it was found that corrosion had been almost as severe immediately below the paraffine disk as at the surface of the liquid, and the metal was nearly cut off at that point.

When a strip of copper was suspended in hydrochloric acid containing potassium bichromate and circulation was caused artificially by a small, electrically driven propeller, the specimen was cut off in 2 days, but opposite the propeller instead of at the water line. In plain hydrochloric acid exposed to the air the same result was obtained.

Action of Sulphur on Steamed Coke

Bureau of Mines Issues Interesting Account of Studies of Behavior of This Material in the Blast Furnace

RECENT studies at the Pittsburgh Experiment Station of the Bureau of Mines have revealed some interesting facts as to the probable behavior of steamed coke in the blast furnace. The chemistry of the blast furnace was thoroughly reviewed and the probable behavior of coke sulphur in the blast furnace was deduced. Enough small-scale tests were conducted to furnish a check on most of the important deductions, and the conclusions derived therefrom accord with what is already known in regard to the forms of sulphur in coke, and fit in well with the general opinion concerning blast-furnace reactions.

It was noticed that the chief contaminating substances in coke were the free sulphur and the ferrous sulphide. Since these two forms are those which steam most readily attacks, it seemed only natural that steaming the coke would considerably lessen the contaminating influence of sulphur on the iron. With a view to checking this point, and also more nearly to duplicate blast-furnace conditions than previously described, several tests were made on both steamed and unsteamed coke.

A quantity of sponge was buried in a small quantity of granular coke in a crucible, which was covered so that there would be no free access of air, and was then heated to a bright red in a muffle furnace. After cooling, the iron was removed and analyzed for sulphur. A distinct contrast was noted between the action of the steamed and unsteamed coke. The sulphur of the iron was increased from 0.38 to 0.69 per cent in the case of unsteamed coke. When steamed coke was used, the sulphur was increased to only 0.48 per cent.

Further tests were made in which 100 grams of powdered lime was mixed with the sponge iron before charging. These tests seemed to show the same general phenomena. It was noted that even with unsteamed coke the iron was slightly desulphurized, this being due to the very intimate contact between the lime and the sponge iron. Such conditions do not prevail in the blast furnace; and, as shown before, the iron does become contaminated with sulphur, even though there be lime present. In the test using steamed coke and lime, desulphurization of the iron was much greater than in the case of unsteamed coke. Since the sulphur had been removed from the surface of the coke chunk by steaming, the lime was not contaminated by this sulphur to the extent that it was with unsteamed coke, so that it could therefore more efficiently desulphurize the spongy iron.

These results would seem to suggest two possible methods for correcting the sulphur trouble in the blast furnace: first, this surface sulphur could be removed by some such process as steaming or hydrogenation; or second, it could be prevented from entering the spongy iron at this zone by dipping the coke in some material which would absorb the sulphur more readily than would the iron. Possibly lime could be used in this case; but whatever the nature of the substance, it should be such that it will not interfere with the proper combustion of the coke at the combustion zone.

A complete description of this investigation will be found in the Bureau of Mining Reports of Investigations, Serial 2518, by John H. Thompson.

American Graphite for Steel Crucibles

As the result of experiments conducted by the Department of the Interior through the Bureau of Mines, it is indicated that American graphites, bonded with American clays, can be used in substitution for foreign graphites in the manufacture of crucibles for the melting of steel.

In the past, American crucible makers have given preference to graphite imported from Ceylon and Madagascar, the Ceylon graphite having been preferred when available. In the Bureau of Mines experiments, made under the direction of the Ceramic Experiment Station, Columbus, Ohio, graphites from Alabama, Texas, Montana, New York and Canada were tested in comparison with graphites from Ceylon and Madagascar. When all factors were taken into consideration, the Texas and Alabama graphites gave superior service to those from foreign lands. The analysis of the steel after the first melts showed that the Texas and Alabama graphites carbonized the steel less than did the graphites from Ceylon. This low-carbonizing feature is important, because it permits the production of a steel of more nearly the desired analysis.

A preliminary report of these experiments is given in Serial 2512, "Graphite From Steel-melting Crucibles," by R. T. Stull and G. A. Bole, which may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

How to Choose and Use Catalysts

This Article Discusses Some of the Factors Which Govern the Choice of Catalysts for Various Industrial Processes

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ONE of the first steps in choosing a catalyst for an industrial process might well be a tabulation of all the materials that are known to facilitate the chemical reactions involved. For example, catalysts for processes of hydrogenation include nickel and its oxide or organic derivatives, copper, platinum, palladium, cobalt and iron. Of these substances nickel and its compounds and copper are the ones generally used technically. Oxidiations can be accelerated by p'atinum, silver, compounds of manganese, cerium, copper, cobalt and chromium, and oxides of iron, vanadium and molybdenum. The addition of water to unsaturated molecules can be brought about by a catalyst such as sulphuric acid (sometimes used with mercury compounds).

Examples of processes of this sort are found in the transformation of acetylene into acetaldehyde and in the production of isopropyl alcohol from propylene. Hydrolyses (reactions in which the addition of the elements of water is accompanied by the breaking down of the original molecule into two or more) such as the decomposition of esters, glucosides, acid amides, polysaccharides, etc., and the saponification of fats for the production of soaps, are catalyzed by mineral acids or their derivatives and by strong bases. The technical importance of this type of reaction is shown not only in the soap industry but also in the manufacture of glucose dextrine, alcohol from cellulose, etc. The formation of diethyl ether and ethylene from alcohol and the production of an important solvent such as ethyl acetate from acetic acid and alcohol are illustrations of dehydrations. The latter are accelerated by the use of sulphuric or phosphoric acids or of compounds such as alumina, thoria, kaolin, etc. (usually employed in hot tube preparations).

Expense and Availability

It is obvious that our consideration of promising catalysts for a given reaction will be influenced by the questions of expense and the possibility of obtaining the material in sufficiently large quantities. Osmium is said to be an excellent catalyst for the synthesis of ammonia from nitrogen and hydrogen, but it is too rare for technical use. Although palladium and platinum will accelerate the hydrogenation of oils, they are comparatively seldom employed for this work, since the far less expensive nickel serves the purpose nearly as well. On the other hand, platinum in spite of its high cost is the standard catalyst for a number of industrial processes such as the contact method for the oxidation of sulphur dioxide and the transformation of ammonia into nitric acid, for the reason that the so-called platinum substitutes have not as yet produced results which warrant their exclusive use.

An investigation of the two last-mentioned operations will also bring out the importance of the physical state of a catalyst. The early methods for the oxidation of ammonia used platinum foil in the form of a corrugated roll placed inside of a nickel tube. Yields of oxides of nitrogen were low, temperature control was difficult, and the cost was high. By employing platinum in the form of gauzes made of very fine wire, it has been possible to overcome these difficulties. In this case, as well as all others which involve heterogeneous systems, the matter of surface per unit of weight of the catalyst is exceedingly important, since the chemical reaction takes place solely on this surface. When a mixture of air and ammonia is passed over one or more platinum gauzes, only a fraction of a second is required for its oxidation. Consequently a small unit will convert large quantities of ammonia into nitric acid, and the cost of the catalyst will be comparatively low on account of the extensive surface per unit of weight.

In order to obtain a good nickel catalyst for hydrogenations it is necessary to reduce the oxide at 300 deg.; lower temperatures produce a material that is too sensitive to external influences, and reduction at 700 deg. yields an inactive form of the metal. Nickel in the form of plates or foil is of little or no use. Amorphous alumina prepared by dehydrating the precipitated hydroxide at temperatures below 400 deg. is an active catalyst for the dehydration of alcohols, but crystallized alumina and amorphous alumina calcined at a bright red heat show very little catalytic power. In the contact process for sulphuric acid manufacture one method of preparing the catalyst involves soaking the heptahydrate of magnesium sulphate in a solution of platinum salt followed by heating in the presence of sulphur dioxide. As a result of this treatment the magnesium sulphate becomes exceedingly porous through dehydration and its surface is covered with a very thin layer of platinum. It is said that with about 5 grams of platinum in this form 1 ton of oleum can be produced per day. The magnesium compound acts as a support for the catalyst.

Another instance of the employment of such a device can be found in the Carpenter-Evans scheme for removing carbon bisulphide from illuminating gas through hydrogenation, $CS_2 + 2H_2 = C + 2H_2S$. The catalytic mass consists of pumice or fireclay impregnated with finely divided nickel. A list of other substances available as supports for catalysts in general includes asbestos, glass wool, silica fibers, porous materials such as alundum or unglazed porcelain, various forms of charcoal, anhydrous salts and porous oxides produced by calcination of suitable minerals. It is clear that a support should not contain any materials that

would lessen the activity of the catalyst or combine with any of the reactants under the conditions employed.

A very important feature in the development of modern catalytic processes is the use of secondary catalysts, sometimes called promoters or activators. When formaldehyde is made by the fractional combustion of methanol, copper coated or alloyed with a fraction of a per cent of silver or of platinum is said to give much higher yields than copper alone. Likewise silver may be covered or combined with a very small amount of rhodium or platinum. Promoters for the iron oxide catalyst employed in the production of hydrogen by the reaction $CO + H_2O \leftrightarrows CO_2 + H_2$ are nickel and oxygen and oxygen compounds of chromium, thorium, etc. Possible substitutes for platinum in the oxidation of ammonia include iron oxide mixed with small amounts of materials such as copper oxide, lime or bismuth oxide.

It is not unreasonable to suppose that the promoters we have mentioned may function by oscillating between higher and lower states of oxidation and thereby enhance the oxygen-carrying properties of the main catalyst. But it is not easy to explain why small amounts of potash are so vitally important as an activator for the iron catalyst employed in the Haber method of ammonia synthesis. Investigations of the mechanism of promoter action offer a field that is exceedingly important. In the meantime no one can afford to neglect the information at present available on this topic.

Poisons and Side Reactions

After a catalyst is in use it is absolutely necessary to protect it against poisons and side reactions. The first attempts to oxidize sulphur dioxide by means of platinum on a technical scale were unsuccessful chiefly because impurities such as arsenic, mercury, phosphorus, etc., or their compounds present in the dioxide poisoned the catalyst. Modern practice sometimes overcomes this difficulty by treating the sulphur dioxide with steam and then passing it through sulphuric acid. The gas is periodically subjected to optical and chemical tests for foreign substances.

Care must be taken to remove traces of arsenic, sulphur, phosphorus, halogens, antimony, tin, zinc, lead (or their compounds), carbon monoxide, free acids, etc., from oils that are to be hardened and from the hydrogen employed in the process. Obviously the nickel catalyst must not be prepared from reagents that contain any of these substances; also it must be kept out of contact with air, since the latter would oxidize the pyrophoric metal very quickly. Probably every catalyst has its particular poisons, but an attempt to list all instances would be beyond the scope of this article. Negative catalysis and the poisoning of catalysts will be more fully discussed in another paper.

It is fitting to point out here that in every catalytic process precautions must be taken against such impurities in view of the fact that very small quantities of them (a fraction of a per cent) can soon impair or totally destroy the activity of the catalyst. The manufacture of diethyl ether is an example of operations in which products of the reaction may harm the catalyst. The water produced dilutes the sulphuric acid, and the heat of the reaction carbonizes some of the unchanged alcohol. Modern technical practice avoids these difficulties by conducting the preheated vapors of alcohol into sulphuric acid maintained at about 140 deg. Excess heat from the reaction is removed by a cooling system; and the vapors of ether, water and unchanged alcohol are carried away from the catalyst to a dephlegmator, where the constituents are fractionally separated.

On Sept. 24 we published a paper by this author on "The Mechanism of Catalysis," which reviewed the available knowledge of catalysts and pointed out their industrial uses. The current paper carries on this subject by placing before the reader the factors that must enter into the choice of a proper catalyst and the weight these factors will have in this choice. The use of secondary catalysts as promoters of the activity of the primary catalyst will be found suggestive. Many valuable hints on proper industrial procedure are brought out in the treatment of the subject of catalyst poisons.

It may be worth while to consider several industrial processes in which the principles we have discussed are applied. When an investigation was made of possible methods for oxidizing anthracene to anthraquinone on a large scale by means of atmospheric oxygen, promising catalysts (oxygen carriers) were tried out. Among these were oxides of titanium, zirconium, cerium, vanadium, cobalt, chromium, molybdenum, tungsten, manganese, iron, copper, etc. Vanadium pentoxide and molybdenum oxide were found to be most effective.

In order to ascertain the influence of certain substances usually listed as catalytic poisons, small quantities of sulphur dioxide and arsenic oxide were purposely introduced into the system. Apparently they were harmless, but compounds of sodium lessened the activity of the vanadium oxide. With regard to the physical state of the catalyst it was concluded that it is generally advisable to sinter or fuse vanadium and then powder it or to put it on pumice. During the course of the war large quantities of acetone were needed for use in the explosive industry. A great deal of the material was made by a series of reactions in which calcium carbide served as a starting point:

$$CaC_2 + 2H_2O = Ca(OH)_2 + CH \vdots CH;$$

$$CH \vdots CH + H_2O = CH_3.CHO;$$

$$2CH_3.CHO + O_2 = 2CH_3.COOH;$$

$$2CH_3.COOH = CH_3.CO.CH_3 + H_2O + CO_2$$

(See Rooney, *Chem. & Met.*, 1920, vol. 22, pp. 847-50.) The transformation of acetylene into acetaldehyde, the oxidation of the latter to acetic acid, and the final production of the ketone from this acid were all carried out by the use of catalysts. We have already mentioned that sulphuric acid is a good catalyst for the addition of the elements of water to unsaturated molecules. In the case of acetylene, however, this acid will not readily do the work alone. In practice a 6 per cent solution of sulphuric acid mixed with some mercury oxide was employed. Here the mercury compound acted as a promoter. For the oxidation of acetaldehyde to acetic acid by air, manganese acetate served as a catalyst. On account of the necessity for a large amount of surface the salt was finely powdered and kept in suspension in the liquid aldehyde by vigorous stirring. Acetone was obtained from acetic acid by passing the latter through heated tubes containing lime distributed on steel balls.

Air Circulation in Dry Kilns

Natural, Blower or Internal Fan Circulation Is Applicable—Amount Required Depends Mainly on Material

CIRCULATION of the air in a dry kiln is a very important factor in the artificial seasoning of wood, as well as in other kiln drying processes. Without a controlled movement of the air it is impossible to maintain the proper temperature and humidity uniform throughout a kiln. Evaporation of moisture from the wood cools and humidifies the atmosphere next to the wood. In order that drying may progress it is necessary to replace this cooled, moistened air continually with a fresh supply of warmer, drier air. This can be accomplished only by a good circulation which will remove the moist, cool air from the kiln or will return it to the lumber after it has been warmed and dried.

In any kiln a certain amount of circulation is natural. The heating coils are continually heating the air, and the evaporation of moisture from the wood and heat losses through the building walls are continually cooling the air. The heated air rises. Some of it escapes through cracks at the top of the kiln, and the rest of it enters the lumber, where it is cooled as it picks up moisture. The cooled air drops and is recirculated over the heating coils until it is warm enough to rise again.

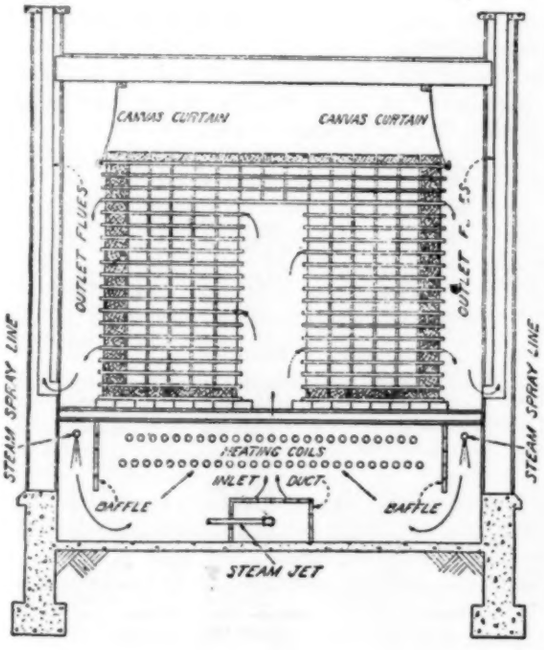
Flues Aid Circulation

If flues or vents for the escape of hot air from the kiln and intakes for the entrance of cold air are provided, the natural circulation can be considerably increased. The kiln, being warmer than the surrounding atmosphere, will act as a chimney, and the draft that is created will speed up the movement of the air inside the kiln. Circulation may be further increased by the use of inspirators, aspirators or steam spray lines. A steam jet in the intake duct is a good inspirator. Aspirators may be in the form of a coil of steam pipe in the uptake flue. Steam spray lines running the full length of the kiln may be installed in the passages through which the air returns from the lumber to the heating coils if the design of the kiln permits. These steam jet lines act as recirculators and humidifiers. Their successful operation depends upon the removal of certain quantities of air from the kiln continuously, either through flues or through accidental leakage. If the air is not allowed to escape at all, it will soon become saturated, and no further drying will take place. The steam spray lines can be replaced by condensers that will serve to cool the air and at the same time remove some of the moisture from it. The cooled air will then naturally fall and pass to the heating coils as fast as the hot air rises from the coils. This natural system of recirculation does not depend upon changing the air in the kiln to remove the moisture evaporated from the wood. Water sprays of the proper temperature may be substituted for the condensers. Water sprays permit a better control of the humidity and may be directed to produce a higher circulation.

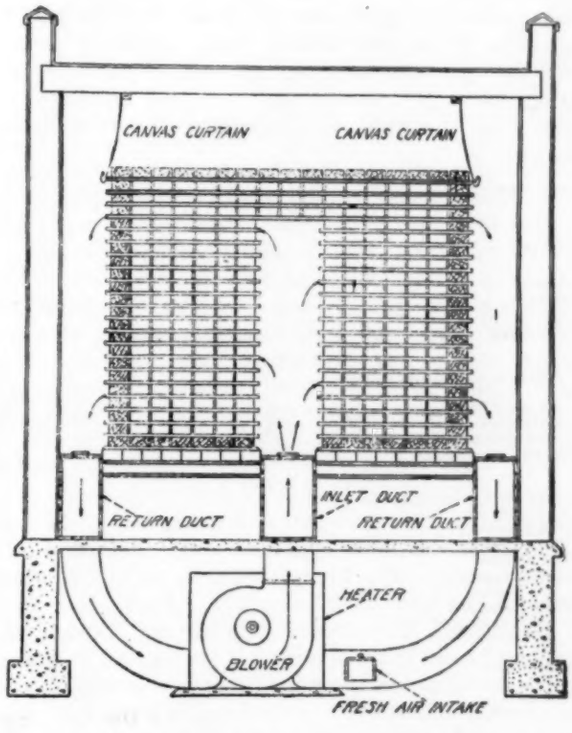
Modern Mechanical Circulation

The modern blower kiln produces circulation by mechanical means, usually by a centrifugal blower of the ordinary type, but sometimes by disk fans. The blower draws the air from the kiln through suitable return ducts and then discharges it again into the kiln through inlet ducts. The air is passed over heating coils on the way and its humidity is increased, if necessary, by means of a steam jet. Leakage is usually

From Forest Products Technical Bulletin 199.



The composite drawing illustrates the various features found in most ventilated kilns. The steam jet in the inlet duct increases the amount of outside air drawn into the system. The steam spray lines increase the circulation of the air inside the kiln. These spray lines in connection with the inlet ducts and the outlet flues serve to regulate the humidity. The baffles prevent the heated air rising next to the walls.



The cross-section illustrates the ordinary blower kiln in which an external centrifugal blower produces the circulation. A fresh-air intake on the suction side of the blower can be opened if leakage of air through the walls is not sufficient to keep the humidity below the desired point. Steam jets can be used to raise the humidity if the air gets too dry.

sufficient to keep the humidity as low as desired, but intakes may be provided for drawing a certain amount of fresh air into the system. This fresh air is comparatively dry, and mixing it with the kiln air displaces some of the moist air and reduces the humidity of the whole.

The internal fan kiln makes use of one or more rows of disk fans within the kiln itself, and thus obviates the necessity of drawing the air from the kiln and blowing it back again. This arrangement has the advantage that the direction of the air circulation may be reversed simply by reversing the direction of rotation of the fans. This reversal of the circulation increases the uniformity of drying in the kiln.

It is difficult to specify the amount of circulation proper for different kinds of drying. For material that has previously been air dried only a small amount of circulation is necessary. For green material, however, or for any drying in which high humidities must be used, a rather rapid circulation is required. There is a limit beyond which the rate of circulation cannot be increased and maintained uniform throughout the kiln. A circulation rate of at least 25 ft. per minute through the lumber is recommended by the U. S. Forest Products Laboratory for difficult drying. In certain unusual cases, as in the drying of Douglas fir common lumber, circulation rates as high as 75 ft. per minute are found desirable.

Byproducts From Coke-Oven Operations

The value of all the important byproducts from coke-oven operations recovered and sold during 1922 was $83,387,763. This amount, however, does not represent the total value of all byproducts, as a large part of them, particularly the gas, was used in the plants where manufactured. The following table summarizes the total production and sales of these byproducts. The quantities given are smaller than appeared probable from the quantity of coke reported to the Geological Survey currently during 1922, and the estimates prepared early this year were therefore higher than these final figures.

Product	Unit	Production	Sales — Quantity	Sales — Value, Total	Sales — Value, Average
Tar	Gal.	327,779,734	162,204,417	$6,419,743	$0.0396
Ammonia:					
Sulphate	Lb.	695,543,349	714,752,882	17,818,236	0.0249
Ammonia liquor (NH_3 content)	Lb.	50,036,646	48,523,937	4,559,535	0.0940
Other forms (NH_3 content)	Lb.	693,782	192,549	12,041	0.0625
				22,389,812	
Sulphate equivalent of all forms	Lb.	898,465,061	909,618,826		
Gas:					
Used under boilers, etc.	M.cu.ft.		19,123,814	1,251,325	0.0654
Used in steel or affiliated plants	M.cu.ft.	*442,671,114	144,976,030	15,942,446	0.1100
Distributed through city mains	M.cu.ft.		56,930,253	20,326,648	0.3570
Sold for industrial use	M.cu.ft.		10,352,921	1,104,096	0.1066
			231,383,018	38,624,515	0.1669
Light Oil and Derivatives:					
Crude light oil	Gal.	† 101,437,555	5,138,095	630,768	0.1228
Benzol, crude	Gal.	2,666,177	2,665,889	698,437	0.2620
refined	Gal.	10,419,504	9,590,459	2,736,944	0.2854
Motor benzol	Gal.	57,025,699	54,930,203	10,491,309	0.1910
Toluol, crude	Gal.	38,159	3,938	652	0.1656
refined	Gal.	1,955,119	1,906,122	556,363	0.2919
Solvent naphtha	Gal.	2,983,858	2,861,482	538,512	0.1882
Other light oil products	Gal.	580,058	212,712	14,949	0.0703
		75,668,574	77,308,900	15,667,934	0.2027
Naphthalene:					
Crude	Lb.	6,107,742	3,298,851	52,103	0.0158
Refined	Lb.	1,810,972	1,589,084	79,149	0.0498
		7,918,714	4,887,935	131,252	0.0269
Other products	....			154,507	
Value of all byproducts sold	....			$83,387,763	

* Includes gas wasted and gas used for heating retorts.
† Of this amount 98,432,100 gal. was refined on the premises to make the derived products listed.

Disposing of Garbage Scientifically

The processes available for the disposal of food waste, as discussed by E. W. McCullough before the Indiana section of the A.C.S., are three in number—Chamberlain, Cobwell and Morrison.

In the Chamberlain system the garbage is charged into a 5-ton tank and rests on a perforated plate. Steam is passed through the charge for 8 hours and the cooked garbage is then passed to a drier. From the drier the tankage is degreased with gasoline, giving a dried tankage and a marketable grease.

In the Cobwell system the garbage goes to steam-jacketed tanks, within which it is both cooked and degreased. In the modified Cobwell system the water content of the green garbage is reduced from 70-80 per cent to 20-30 per cent, by means of a preliminary drier before it goes to the Cobwell tank.

In the Morrison system the green garbage is cooked and dried in the same tank and discharged as a deodorized, clean product. This material goes to the degreaser and follows the regular procedure. The Morrison tank does away with the odor nuisance better than the other systems and has a much lower initial cost. The value of the products obtained in the use of the three systems is about the same. The most important factor aside from the initial costs is that of operation and maintenance. The saving on gasoline consumption on the Morrison process in a year's time is estimated to equal the value of the products produced. The cost of operation of the Morrison process was said to be the lowest of any process.

Acetylene Congress in Paris

The Eighth International Acetylene and Auto-Welding Congress will be held in Paris at the Grand Palais on Dec. 13. This is the sequence of that held in Rome in 1913, which was to be followed with that of Paris in 1914.

The committee on organization has as its president the president of the French Chamber Syndicale d'Acètylene, M. Ed Fouché.

Improving Production by
Eliminating Industrial Hazards
In Chemical Engineering Industries

Twelfth Annual Congress of National Safety Council, Buffalo, N. Y., Oct. 1 to 5, Yields Valuable Information on Benzol Poisoning, Safe Handling of Solvents and of Acids, Elimination of Dust Hazard, etc.

BY *Chem. & Met.* STAFF CORRESPONDENT

BENZOL poisoning may be largely eliminated if precautions outlined at the twelfth annual congress of the National Safety Council are generally observed. This congress, held at Buffalo, N. Y., during the week of Oct. 1, was productive of many other findings of interest to the chemical engineering industries. Among the more important topics discussed were dust hazards, handling of acids, safe storage of volatile liquids, treatment of chemical burns and a safety code for the laboratory.

Intensification of the activities of industrial sections so that accident prevention may be developed to a higher degree of efficiency was recommended by L. A. De Blois, manager of the safety division of E. I. du Pont de Nemours & Co., in his address of acceptance of the post of new president of the council. Stimulation of greater public interest in safety work, especially among industrial connections, improving the council's sources of statistical information, continuing the policy of local council organization and of developing closer relationship between the council and national trade associations as a means toward the goal of universal safety were outlined as the chief endeavors that the council must carry out during the ensuing year.

Retiring and new officers were unanimous in their assertion that the congress was the most successful in the history of the organization. This was true not only from the attendance standpoint, the number of delegates far exceeding that of any previous convention, but because of the exceptional interest and enthusiasm shown by the delegates in the discussions of methods to conserve life and health and because of the constructive good they derived from the general meetings and those of the industrial sections.

BENZOL POISONING REPORT

The report of the committee on benzol poisoning, that only recently has been shown to be a serious hazard in industry, was the chief subject of discussion at the joint meeting of the chemical and rubber sections. Following the reading of the report, it was decided by the delegates that the committee should make a more thorough study of the problem and make another report at the next safety congress, by which time, it is expected, it can present a complete and final report.

Several speakers emphasized the point brought out by Dr. C. F. Horan of Watertown, Mass., a member of the committee, that hearty co-operation of the various rubber and chemical plants is necessary in order that the committee may come into possession of actual experiences, especially those concerned with the results of examinations of employees prior to the time they come into contact with benzol and for periods thereafter when they are re-examined to determine what effect the contact has had.

During the discussion suggestions were made by some of the delegates that, because of its potential industrial hazards, benzol be dispensed with and substitutes be used. Three possible substitutes mentioned were carbon tetrachloride, xylol and toluol. The general sentiment of the delegates, however, based upon the experience of those who had experimented with these substitutes, was that only indifferent results are obtained from them and that the industries must carry on with benzol and must conquer the hazards it presents.

Tentative recommendations contained in the committee's report include these precautionary measures as a means of preventing poisoning by benzol in processes where this material constitutes a hazard:

1. The use, where possible, of inclosed apparatus for the handling of benzol.

2. The use of special exhaust ventilation where employees are exposed to the fumes of benzol—that is, wherever benzol is evaporated at room temperatures, air removal by general room ventilation with down draft is recommended, although in certain inclosed draft may be indicated. Where localized heat is applied direct ventilation (from the inclosure) with upward draft may be indicated. Again localized heat is applied in the evaporation of the benzol, hoods or inclosures should be provided with up-draft. This draft should be sufficiently intensive and applied so closely to the point of origin of the evaporating benzol that it will insure the complete removal from the hood or inclosure. This recommendation deals with specific processes where sufficient upward air movement is created by the heated surface to overcome the natural density of the benzol vapor.

3. The use of the special exhaust ventilation for tank cars and other containers, together with the use of special protective breathing apparatus in the cleaning of tanks and other inclosed spaces where benzol may constitute a hazard. The committee does not recommend the use of the ordinary commercial respirators as a means of preventing the absorption of benzol fumes.

4. Physical examination and re-examination of all new employees with the object of excluding from benzol processes those suffering from organic diseases of the heart, lungs or kidneys, from hermorrhagic tendencies or from anemia.

Various other recommendations were made more gen-

eral in form, with regard to departmental transfers of workers, etc.

The paper of A. G. Smith, chemical engineer of the Travelers Insurance Co., Hartford, Conn., on "Safe Handling of Solvents" was in line with the report of the benzol poisoning committee.

Handling Acids Industrially

Emphasizing the value of the paper read by M. F. Crass, Grasselli Chemical Co., Cleveland, Ohio, on "Safe Transportation of Acids in Carboys and Drums," Ira V. Kepner of the Pennsylvania Salt Manufacturing Co. cited an example of a very bad accident resulting from the mishandling of drums. One of the points brought out during the discussion of this paper is that the members of the Manufacturing Chemists Association are co-operating with the federal bureau of explosives in developing the highest possible type packages to reduce injuries to workmen and losses in transit.

It was the consensus among the delegates to the sectional meeting that the paper by Henry Marsh of the Hercules Powder Co., Wilmington, Del., was one of the most valuable treatises on the subject that has ever been presented, and a motion was carried to make the safety code he recommended the basis for a code of safe practices in chemical laboratories.

E. J. Riederer of the Atlas Powder Co., Wilmington, Del., suggested that while the paper was prepared for use in explosives laboratories it also is practical in general chemical laboratories. Mr. Webb of the Eastman Kodak Co. pointed out that his concern gives further protection for drying ovens than suggested by the speaker by providing collapsible backs on ovens so that, in case of flashes within, the pressure would be relieved by the back blowing out into a locked chamber.

During the round-table discussion of chemical burns Dr. Slater of the Eastman Kodak Co. declared that the degree of burns can be largely reduced by the prompt application of water in a large volume. He said that they should be flushed with water prior to the application of the neutralizing agent and that the healing compound or agent should be the third step taken in treatment of burns.

Dust Hazards Considered

Chemical aspects of dust hazards were among the things considered at a special meeting of the dust explosion hazards committee of the National Fire Protection Association. David J. Price, chairman of the committee and engineer representing the Bureau of Chemistry in the government investigations of industrial dust explosions, stated that special attention was given to the discussions of fuel pulverizing systems and dust explosion hazards in terminal grain elevators. Sugar pulverizing systems, flour and feed mills, cocoa pulverizing systems, starch factories, sulphur grinding systems and other dusty industries came in for their share of attention.

"There are 21,000 industries in the United States which have dust explosion problems to solve," said Mr. Price. "The importance of those industries can be understood when I add that the products of those industries are worth more than six and three-quarters billion dollars annually."

This special meeting was called to revise some of the systems submitted to the last meeting of the National Fire Protection Association held in May, 1923. The revised report will be considerably amplified in comparison with the original report in view of many new data on the subject obtained since last May.

Various kinds of safety devices were exhibited. Among those of special interest to the delegates were goggles which hook over ordinary glasses; gas-tight rubber goggles with a water compartment designed to prevent the fogging of goggles under humid conditions; a gas mask and life belt that will hold workmen in upright position and facilitate their rescue through manholes and tanks; eye spray and irrigation appliance, first aid equipment, etc.

These were chosen as new officers of the association: President, L. A. De Blois, Wilmington, Del.; vice-presidents, C. B. Auel, East Pittsburgh, Pa.; Marcus A. Dow, New York; George T. Fonda, New York; H. A. Reninger, Allentown, Pa.; David Van Schaack, Hartford, Conn.; vice-president and treasurer, Homer E. Niesz, Chicago; managing director and secretary, W. H. Cameron.

A. L. Watson, personnel director of the Hooker Chemical Co., Niagara Falls, N. Y., new chairman of the chemical section, was chosen a sectional representative on the executive committee. The following were selected to head the rubber section: C. F. Horan, Watertown, Mass., chairman; E. L. Hewitt, New Haven, Conn., vice-chairman, and C. T. Wilson, Akron, Ohio, secretary.

Handling Solvents Safely

Problems of Storage and Use of Volatile Solvents in Rubber Plants Introduce Considerations Common to Many Industries

By A. G. Smith

Chemical Engineer, Travelers Insurance Co., Hartford, Conn.

THE problem of safe handling of solvents may be attacked from various angles. It appears that of late the general tendency in the rubber industry is to create processes that overcome the necessity for using solvents in large quantities, or that render those used less flammable. Advances in precautionary methods in handling solvents have been mainly in the establishment of improved storage facilities, ventilation, building isolation where the greatest quantities of solvents are used, solvent recovery systems and education of employees in the expediency of giving appropriate regard to the dangers of solvents.

The storage of solvents creates various hazards, the most prominent of which are due to possibilities of fire and explosions. The character of installation, quantity of supply and protection against escape of liquid or vapors that may extend to surrounding property are governed to a certain extent by local ordinances and insurance underwriting regulations.

The use of underground storage tanks for solvents is preferable, as they minimize exposure to ignition. The initial cost of installation for large-quantity storage of solvents, however, is the deciding factor between underground and above-ground systems for some manufacturers. The common practice is to keep large supplies in above-ground tanks located on ground sloping away from the plant and where there is a minimum opportunity for sparks from smokestacks, locomotives, smokers, etc. Above-ground installations are commendable, since leaks may be readily detected and installations easily

An address before Twelfth Annual Safety Congress, Buffalo, N. Y., Oct. 1-5, 1923.

inspected. Tanks may be painted and maintained in good condition, thereby preventing depreciation, which is more difficult to prevent for underground systems and where leaks may occur, and unless a careful check is made of consumption, the leaks may not be discovered unless located by means of seepage, which may promote a severe hazard.

Above-ground tanks should be provided with goose-neck-shaped breather pipes fitted with a copper wire screen of not less than 40 mesh. Variations in climatic temperatures where solvents of relatively high volatility are concerned produce either a pressure or a slight vacuum within the tanks, and this vent offers a relief. Installations consisting of a number of tanks located in a warm climate may have vents connected to a common main, terminating at a point where the solvents may be recovered or disposed of in the atmosphere with the least amount of exposure to ignition. Tanks painted white theoretically cause less evaporation of solvents than tanks painted black or other colors.

The loss of solvents to the atmosphere by means of evaporation and the hazard of flammable vapors prevalent in the atmosphere may be overcome to a certain extent by use of a newly developed compound consisting of a mixture principally of calcium chloride, glucose, glycerine, cornstarch and glue. These ingredients, when thoroughly agitated and introduced into storage tanks, are not soluble in gasoline and some of the other common rubber solvents. When applied about 1 in. thick, this mixture totally covers the surface of the liquid in the tank and excludes the air. Its weight, when made into a sort of emulsion by agitation, is about 4¾ lb. per gallon, being light enough to float on the surface of the solvent.

When more than one solvent is maintained in a battery of storage tanks, valves to distributing mains should be marked in some way to indicate when the valve is cracked open or closed. Pipe lines carrying different solvents should be painted distinguishing colors.

It is good practice to have pipe lines that lead from storage tanks to pumps located within a plant or to auxiliary storage tanks fitted with fine mesh screens to prevent any flames from extending back to storage tanks should a conflagration occur, even though these pipe lines are fitted with stop valves. Motor-operated pumps, when located in the vicinity of tanks, should be housed in vapor-proof compartments, and all fuses, starting boxes and rheostats should be inclosed.

Difficulties of Benzol Storage

The storing of benzol during winter months introduces the need of locating the storage tanks in heated fireproof buildings. Benzol has the peculiarity of freezing and solidifying at 40 deg. F. It is possible to store benzol above ground in outside tanks fitted with steam coils, because benzol in solidifying does not expand and rupture tanks as water does. This storage practice has its faults, however, as the heating process is likely to produce vapors that are particularly susceptible to ignition. The most feasible means of storing it is in moderately heated fireproof buildings.

Owing to the unusually great volatility of carbon bisulphide as compared with other solvents used in the rubber industry, this should be stored under water. Water dissolves carbon bisulphide to the extent of about 0.5 per cent, but without imparting any dangerous properties to the water.

Solvents or their vapors have been ignited by static electricity primarily because of the plant operator's disregard of the possibilities of static electricity accumulation and discharges, or because certain conditions likely to create static electricity are not suspected. It is quite a well-known fact that a cold dry winter day is most favorable for static electricity generation, but this is not the only climatic condition that may be favorable. Generally speaking, any atmosphere containing a minimum amount of humidity may be just as favorable.

Elimination of Static Electricity

When certain machines, such as winding or spreading machines, are suspected of causing static electricity, a simple test may be made by holding the back of the hand within 2 or 3 in. from the material going through the machine and if static is present an unmistakable tingling sensation will be noticeable. A neon gas detector as used for testing spark plugs on automobiles is also a sensitive testing device.

There are varying precautions that may be suggested to minimize the dangers of solvent vapor ignition. One of the fundamental reliefs from the hazard in rubber goods or rubber cement plants is permanently to ground each moving part of the spreading, slitting, winding or re-winding and agitating units to a common ground conduit that is positively grounded. Oil used in lubrication insulates one machine part from another. Soldering connections does not suffice in all instances, as vibration is likely to sever such connections. Screw connections with lock washers and nuts are more dependable. Many thousand volts with relatively low amperage have been known to accumulate in a machine, on a belt or in a solution, and unless this is thrown off by ground or otherwise dissipated a spark at a time when the explosive range of the solvent vapors in the air is correct is likely to produce disastrous results. Another means of preventing static electricity accumulation or its creation is to render the atmosphere in a room humid by distributing steam from jets uniformily located about the room, or if a single machine is to be relieved of any static generation, a perforated steam pipe near the source of generation will dissipate the static. Objections are raised by some manufacturers of rubber products to this practice, as it is claimed that blisters in the rubber are caused by the presence of the moisture.

For spreading, winding and cutting machines, metal idler rolls, horizontal bars having slight projections located close to the material passing through the machine or metal strips on metal pulley shafts connected to a ground are commendable in drawing off the static. Replacement of belts for gear drives and providing metal plates for operators to stand on when tending machines are also steps that help to eliminate static.

Characteristics of Solvents

When we speak of solvents having certain tendencies to produce an explosion, we refer to the likelihood of the vapors of these solvents being ignited in the atmosphere. The range of explosibility means the amounts of these vapors contained in an air mixture that is susceptible to explosion. These limits can be varied greatly by circumstances such as room dimensions, character of ignition, presence of moisture in atmosphere, temperature, etc. The wider the range of explosibility the more susceptible the vapors are to ignition.

Carbon bisulphide finds a moderate application in

rubber plants for cement making and cold cure process. In commercial form it produces vapors that are heavier than air; therefore in instances where it is used in quantities it is particularly desirable to ventilate the department in which it may be used, by means of openings direct to the atmosphere near the floor level or by down-draft ventilating systems.

Carbon bisulphide is an endothermic compound. The elements forming it may be considered as being in a state of chemical stress and capable of giving rise to a very considerable amount of heat by the mere action of their separation. In other words such a substance will give more heat when burned as a compound than can be obtained from burning its separate elements in the uncombined state. It has been determined that carbon bisulphide may be spontaneously ignited at about 270 to 300 deg. F. This would make it possible to ignite it by its contact with steam pipes carrying a pressure of approximately 60 lb. Particular notice should therefore be taken of storing of any containers of carbon bisulphide, handling it as a solvent or distributing it through pipe lines near power steam lines. As there appear to be considerable quantities of carbon bisulphide used as a solvent and in conjunction with sulphur monochloride in the "cold cure" process, it would be particularly desirable for the manufacturer to isolate the use of carbon bisulphide for these operations in order to obviate any bad experiences.

Carbon bisulphide is extremely sensitive to explosion by ignition when mixed with three times its volume of oxygen or an amount of air containing that volume of oxygen. The combustion of the liquid or vapors by a conflagration or explosion creates such irrespirable gases as sulphurous and carbonic acid gases, and therefore introduces a serious hazard in combating a fire of this kind.

The handling of this solvent in the plant in dip tanks, in cement solutions, etc., should necessarily be in limited quantities, and the fumes should be exhausted or removed by ventilation, because inhalation of them is extremely dangerous. They create such physiological symptoms as headaches and digestive troubles, they affect the sense of vision and produce involuntary trembling of hands and legs. Continual breathing of vapors in small quantities may result in severe nervous ailments and insanity.

Benzol a Toxic Compound

A solvent that is used to a considerable extent is benzol (oftentimes called benzene), which has a flash point in the vicinity of 25 deg. F. and has an explosive range in air from 2.7 to 6.5 per cent by volume. Its vapors are readily diffusive in the air and readily create a medium particularly susceptible to ignition, provided, of course, the amount of vapors is within the limits mentioned. Because of the agreeable odor of benzol fumes, the average person does not consider them objectionable to inhale, consequently persons working in a room where the vapors are prevalent do not always realize when they are producing toxic effects. The vapors, however, are poisonous as well as explosive; therefore there is a need of either preventing their creation by effective ventilation or confining the solutions while they are being used, to prevent evaporation as much as possible. Benzol vapors when inhaled in moderate quantities produce sleepiness, faintness, headaches, nervousness, muscular prostration and irregularity in pulse. Severe accidents have been caused by person being affected with small quantities of benzol to the extent that they will stagger and fall in moving machines or be otherwise injured by loss of control of their actions. Long exposure causes marked diminution of white corpuscles in the blood and degeneration of the liver, kidneys or other internal organs.

Toluol, xylol and solvent naphtha are occasionally used to produce rubber solutions. Their physiological effects on workmen do not vary considerably from those produced by benzol, although they may under average circumstances be slightly less drastic due to these solvents being somewhat less volatile than benzol. The volatility and flammability of each may be indicated by stating that commercial toluol ordinarily has a flash point in vicinity of 45 deg. F., xylol 80 deg. F., and solvent naphtha near 60 deg. F.

Handling Gasoline Safely

Gasoline is being used extensively in this country as a solvent, not only because it is ordinarily less toxic in its effect upon workmen but because it is generally conceded to be more efficient as a solvent. It is employed as such in varying degrees of purity. A number of manufacturers obtain good results in the preparation of rubber plastic for use in impregnating fabric or for production of certain grades of cement by using a gasoline of a gravity near 70 to 75 deg. Bé.

In view of this and on account of the fact that the vapors are heavier than air, suction ventilators are essential near the machines in order to eliminate the vapors from the atmosphere and to maintain safe working conditions in the plant.

It is judged that the range of explosibility of gasoline of this grade is between 1.5 and 6.4 per cent by volume in air. The hazards of explosion and toxic effects created by inhalation of the vapors are comparable to the effects that might be experienced with other light hydrocarbons. The vapors affect some workmen to the extent of producing headaches, stomach trouble, nervousness, vomiting and vertigo and temporary dullness of senses. These experiences by workmen may be prevented by appropriate ventilation and frequent change of occupation. Some manufacturers have replaced the use of benzol by the introduction of naphtha or gasoline mainly for the purpose of decreasing the poisoning hazard. It is claimed that wherever this practice has been introduced, satisfactory production results have been obtained and there is less complaint of effect upon employees.

Th solvent carbon tetrachloride has been used with a fair degree of success in producing rubber solutions and is relatively safe to store and use in a plant because it is non-flammable. Its market price, although fluctuating, is generally higher than other solvents that are adaptable to the rubber industry, therefore its use has been limited. To overcome this objection some manufacturers have used other solvents such as benzol, naphtha or gasoline and have blended one of these particular solvents with carbon tetrachloride on a fifty-fifty basis, thereby reducing the flammability of that solvent possibly one-half, and good results have been obtained from a safety and quality of production standpoint. In this connection it might be said for the sake of comparison that these solvent solutions have about the same flash point as kerosene, or in the neighborhood of 100 deg. F.

Absorption

The Article Published Below Is an Advance in the Technology of This Unit Process and as Such Is of Significant Interest to Production Men in the Chemical Engineering Industries

Modern Methods of Ammonia Absorption

How Coal and Coke-Oven Gases Are Condensed and Byproducts Removed by Scrubbing—Some of the Problems Encountered and Results Obtained

By F. W. Steere
President, Steere Engineering Co., Detroit, Mich.

THE problem of condensing coal gas and byproduct recovery begins as soon as the gases leave the retort. This applies to both large and small installations—that is, to coal benches or coke ovens.

As the gas leaves the retort it contains not only the byproducts, ammonia and tar, but a very complicated series of hydrocarbon vapors, some of which begin to condense immediately upon leaving the retort where the temperature is still near the temperature of distillation.

The hydrocarbon vapors which condense on cooling are recovered in the smaller plants in the form of tar. In larger plants, such as coke ovens, the light oils are also recovered in addition to the tar. Besides the tar and light oils, ammonia is recovered usually by one or two processes. In large installations the gas containing the ammonia vapor may be brought in direct contact with sulphuric acid, the ammonia being recovered in the form of ammonia sulphate. In small plants and many of the coke-oven plants the ammonia is recovered in the form of aqua ammonia.

The usual practice in most coal-distillation plants is to bring the gas in contact with water in some form of foul main as soon as the gas has left the retorts. The foul main serves two purposes—it lowers the temperature of the gas to approximately its saturation temperature and at the same time removes the higher boiling hydrocarbons and the free carbon which is carried by the gas. This accumulation in the hydraulic main is usually referred to as pitch.

One of the problems on which there are very few accurate data and which governs to a very great extent the size of the condensing plant necessary is the saturation temperature of the gas. Obviously the gases leaving the retort are at temperatures very much above their dew point or saturation temperature. This temperature varies with the kind of coil charged and the amount of moisture mechanically carried into the retort with the coal. Fig. 1 shows how rapidly the heat content of the gas changes with the saturation temperature.

The problem of cooling gas is really a problem of cooling the water vapor carried by the gas, as the sensible heat of the gas itself is relatively small. There has been an unmistakable tendency in the last few years to cool the gas by direct condensation—that is, to bring the gas in direct contact with the cooling medium, resulting in very rapid condensation. The old theory of condensing coal gas was to bring about the cooling very slowly, the theory being that rapid condensation would tend to condense out hydrocarbon vapors which were of value to the gas and which would otherwise be carried to the consumer's burner.

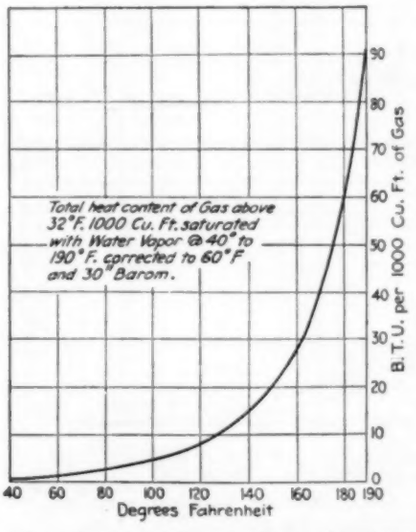


FIG. 1—RELATION OF HEAT CONTENT OF GAS TO SATURATION TEMPERATURE

Direct Condensation of Coal Gas

Direct condensation as now practiced is brought about in one or two shells, the gas entering the bottom and ascending through a series of grid work over which the cooling medium is sprayed. The gas, under ordinary conditions, enters this washer cooler saturated with water vapor and usually, in case of coal gas, at temperatures somewhere around 165 deg. F. As the gas passes through the tower it is cooled and the condensate drops back continuously into the hotter zones in the lower part of the tower. This condensate is continually drawn off from the bottom of the tower, pumped through cooling coils and returned to the top of the tower as the cooling medium. The gas leaves the top of the tower at approximately the temperature of the cooling medium as it comes from the cooling coils.

It will be seen from this that the gas is cooled by recirculating a portion of its own condensate after cooling. This eliminates the possibility of stripping from the gas any of the vapors which would be soluble in fresh water and at the same time bringing about approximately ammonia vapor tension equilibrium between the liquor in the base of the tower and the incoming gas. If this process is split up into two compartments, as is usual in coal gas condensation, the strength of the ammonia liquor in the first or primary shell is rather low because of the relatively high temperature of the liquor in the base of the shell. The ammonia concentration in the base of the second shell, however, is considerably higher, as it is customary

to bring the gas to the secondary at from 100 to 110 deg. F.

Up to this point, tar as well as condensible hydrocarbons and ammonia are all coming down together as the temperature is decreased. The liquor for recirculation is separated from the tar by decantation, the tar settling to the bottom of the liquor compartment in the base of the washer cooler and the liquor being drawn off at the top.

Thus there will be a considerable excess of condensate coming from the primary washer cooler. This excess is overflowed by gravity to the base of the secondary, where it is again recirculated through the secondary cooling coils and through the secondary tower. This serves to increase the strength of the ammonia liquor coming from the secondary. At this point the gas is reasonably free from tar and the heavier hydrocarbon vapors. The ammonia content of the gas has been reduced approximately 50 per cent. The recovery of the remainder of the ammonia, when aqua ammonia is made, is brought about by bringing the gas into direct contact with water in one of the four general types of ammonia-recovery apparatus: bubbling washers, tower scrubbers, mechanical scrubbers and the so-called intensive scrubber.

The other system of condensing coal gas, which is in common use and which is much older than the system described above, is to bring the gas through condensers of the tube type. In cold weather the first of these condensers is cooled by air and later by water passing through the tubes and the gas around the tubes. By this method of condensation the gas is cooled more slowly and is not directly washed or scrubbed until the temperature has been reduced as much as possible.

The various methods for the final recovery of ammonia are theoretically the same. The difference in the various types of machines is in their mechanical design and the schemes used for bringing about the maximum contact between the gas and water at the minimum of expense.

After passing through one of these systems, the ammonia is recovered from the gas in the form of a weak liquor of from 1½ to 2½ per cent strength. This liquor is then distilled and the ammonia recovered in the desired concentration. This distillation, which is carried on by steam, also removes from the ammonia liquor the many objectionable impurities which the crude liquor carries.

Carburetted water gas, which is made and distributed by many public utilities exclusively and by a great number of utilities by being mixed with coal gas, is cooled and condensed in much the same way as described above except, when direct condensation is employed, the cooling may be brought about in one washer cooler tower in place of two or more.

No ammonia is recoverable in commercial quantities from carburetted water gas. Tar is obtained as the result of the cracking of the oil used for enrichment and is recovered in practically the same way as is the tar from coal gas.

The problem of the saturation temperature is much more important and very much less under control in carburetted water-gas practice than in coal-gas practice, as the saturation temperature depends to a very considerable extent on the amount of steam which is used in the water-gas process.

After the heat is removed, the extraction of the first 90 to 95 per cent of the tar is relatively simple; most of this automatically comes down as the temperature is lowered. The last few per cent of the tar remaining in the gas, however, is very difficult to remove. In most plants no attempt is made to remove completely the tar fog from the gas before it enters the purifiers—that is, apparatus which removes the hydrogen sulphide from the gas. The hydrogen sulphide in either coal gas or water gas is removed by passing it through beds of iron oxide, the tar fog being taken up in the first part of this process. This obviously renders the oxide method of purification rather inefficient, as the reaction between the hydrogen sulphide and the iron oxide takes place very slowly when the iron oxide is coated with a film of light oil or tar. This necessitates frequent changes of the oxide.

To eliminate the tar fog effectually, in many plants shavings scrubbers are run ahead of the oxide purifiers so that the tar fog is taken up in the shavings scrubber before reaching the beds of oxide.

In liquid purification plants the tar fog is to a considerable extent scrubbed out in the purification towers and the hydrocarbon vapors, along with the hydrogen sulphide, are blown into the atmosphere from the actifier towers.

Fig. 2 shows the rate of absorption of ammonia in the primary and secondary washer coolers and in a six-compartment intensive scrubber. These tests were taken at the coal-gas plant of the Rochester Gas & Electric Corporation, Rochester, N. Y.

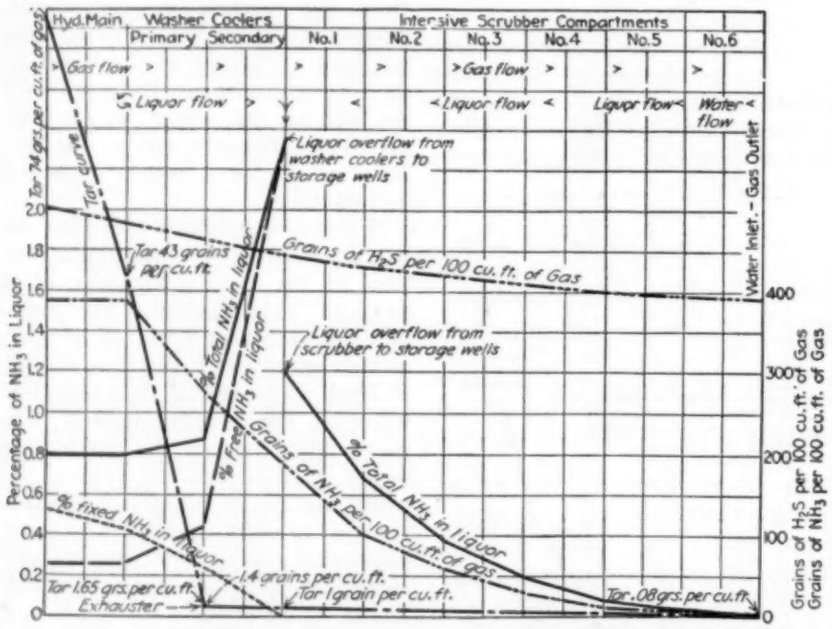


FIG. 2—ACTUAL PERFORMANCE CURVES FOR AMMONIA ABSORPTION IN WASHER COOLERS AND INTENSIVE SCRUBBER

Gas made in 24 hr., = 4,453,000 cu.ft.
Temp. entering primary washer cooler, 152 deg. F.
Temp. leaving primary washer cooler, 116 deg. F.
Temp. entering intensive scrubber, 74 deg. F.
Temp. leaving intensive scrubber, 68 deg. F.
Water rate to intensive scrubber, 8 g.p.m. at 37 deg. F.

Equipment News

From Maker and User

Measuring the CO Content of Gases Electrically

The CO content of mixed gases is often of importance. This is, of course, especially true in obtaining efficient combustion, although there are many other occasions when this quantity should be known. This can be obtained by Orsat analysis; but the method is slow and requires much skill to operate. For this reason, the Bacharach Industrial Instrument Co. of Pittsburgh is marketing the S. & H. CO meter, designed by the same engineers who designed the S. & H. CO_2 meter, recently described in these columns.

The operation of the meter is based on the catalytic action of a heated platinum wire in producing combustion of CO with oxygen. Referring to Fig. 1, *A* and *B* are two small platinum wires, each passing through the center of cylindrical chambers in two separate metal blocks. *B* is the comparison

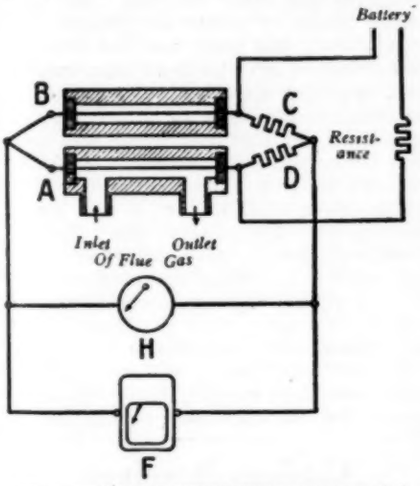


FIG. 1—DIAGRAMMATIC LAYOUT OF CO METER

wire, and *A* is the measuring wire in the chamber through which the sample of flue gas passes slowly. The wires are heated to a temperature of about 800 deg. F. by an electric current. Usually enough oxygen is present in the waste gases for the combustion of the CO and hydrogen, but to make certain of this, air to the amount of 20 per cent of the gas volume is admitted through the small passage *E*, Fig. 2. The catalytic action causes the CO and H_2 to burn along the surface of the wire *A*, thereby raising its temperature and increasing its resistance in almost exact proportion to the amount of these gases present. When considerable amounts of CO are present, the wire is heated to a brilliant glow. As *B* maintains constant temperature and resistance,

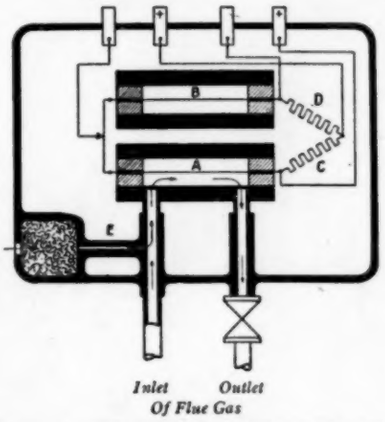


FIG. 2—CUT SHOWING DESIGN OF METER

the Wheatstone bridge circuit, consisting of the wires *A* and *B* and the resistances *C* and *D*, becomes unbalanced, and causes an indication on the galvanometers *F* and *H*.

These instruments are calibrated in percentage of CO or CO plus H_2. As the combustion heat of a given volume of H_2 is almost identical with that of CO, the CO meter may serve for a mixture containing both gases. For boiler house practice it is not necessary to know what fraction of the sum is CO and what fraction is H_2; the important thing is the indication that these combustibles are present and to what extent combustion is incomplete. Methane or other hydrocarbons are not indicated, but they occur only in small quantities except where the CO content is extremely high.

The catalytic effect is naturally dependent to some extent on the velocity with which the gas flows past the wire *A*. As the electrical CO meter is mostly used in addition to an electric CO_2 meter described in a previous article, the dimensions in the CO meter are chosen to be in accordance with medium rate of gas flow; this flow being the same as the one streaming through the CO_2

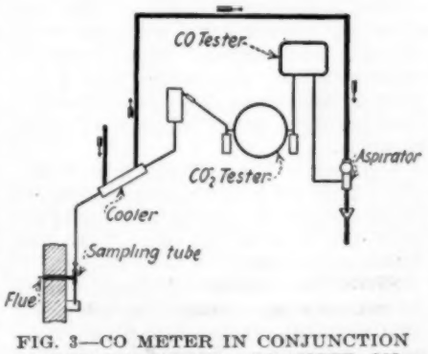


FIG. 3—CO METER IN CONJUNCTION WITH CO_2 METER ARRANGED ON FLUE FOR TESTING GASES

meter; changes of as much as 100 per cent in this rate of flow have practically no influence. The effect of difference in heat conductivity due to CO_2 (see previous article regarding the CO_2 meter) is present in the CO meter just as in the CO_2 meter; this effect is in the CO meter so completely overbalanced by the catalytic action that even the highest percentage of CO_2 possible in boiler waste gases has less influence than 0.1 of CO.

The arrangement of a CO meter with accessories and combined with a CO_2 meter is shown in Fig. 3. The gas sample is drawn in continuously by an aspirator through a cooler around which circulates the water going to the aspirator; from there the gas passes through the water filter to the throttle disk and to the CO_2 meter, which is equipped with a small control filter and a manometer for checking the velocity of the gas sample; thence to the CO meter and the aspirator.

The CO meter requires across its terminals a voltage of 2.7 and the current passing through the Wheatstone bridge of the CO meter amounts at this voltage to 0.85 amp. To supply this current, a storage battery may be used or the CO meter may be connected to a d.c. line of 120 or 240 volts; in both cases a resistance of suitable amount must be provided in series with the CO meter to keep the current within the given limit of 0.85 amp.

In general, the indications of combustible gases by this instrument are accurate within a few tenths of 1 per cent. Greater accuracy than this cannot be expected and in practice is not necessary. What is required is a sure indication that combustible gases are being wasted, and this the CO indicator cannot fail to show, if correctly installed. Furthermore its indications are more accurate and certain than those of any other device now available for the purpose.

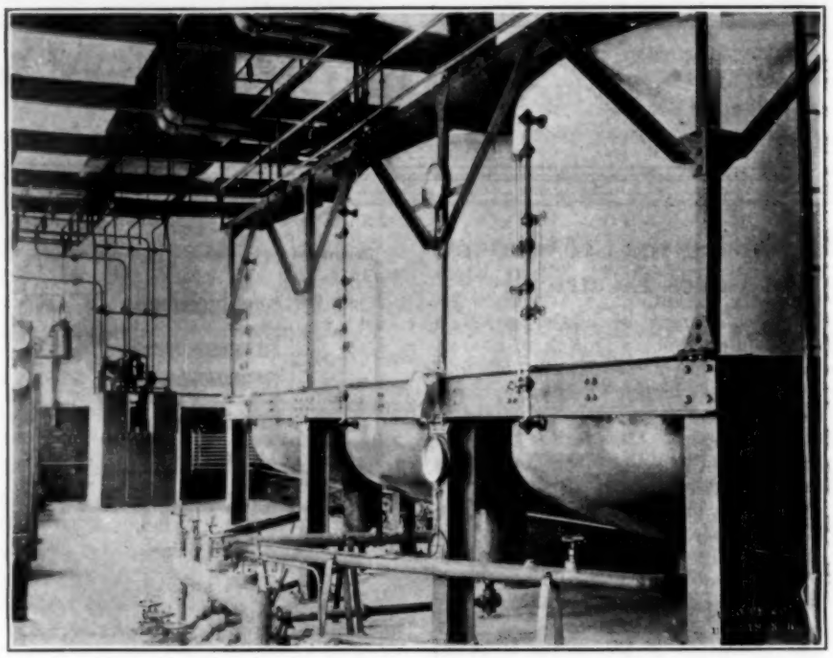
Getting More Work From the Tractor

The rapidly increasing interest shown by the chemical engineering industries in industrial tractors and trucks makes any development along these lines worthy of note. And not the least interesting of recent developments is that just announced by the Mercury Manufacturing Co. of Chicago, in placing its new model—the Type H—on the market.

This tractor substitutes an internal gear drive for the worm drive used on other models and until now standard in tractor design. The most important

advantage claimed is an increase—as demonstrated by elaborate tests—of 25 to 35 per cent in the work-output efficiency, compared with the Type L, the best of the worm-driven models. These tests showed, for example, that at 200 lb. draw-bar pull, the new model was developing an efficiency, indicated by speed and current consumption, 23 per cent greater than the Type L; at 600 lb. draw-bar pull, 28 per cent; at 800 lb. draw-bar pull, 40 per cent, and so on. This increase in efficiency means an ability to run longer on one charge, or handle heavier loads during the same length of time, or reduce the amount of the charge without reducing the reserve capacity of the batteries.

The second advantage claimed for the new tractor is its remarkable serviceability. The simplicity and rugged construction of Mercury tractors have always made them noteworthy for their ease and economy of maintenance; but the new type is in a class by itself in operating efficiency. Five of the new tractors in service more than two years have not required a single replacement part for the drive. It is claimed that this is a record never approached by worm-drive tractors.



18,000-KW. KAELIN TYPE ELECTRIC-STEAM BOILER INSTALLED FOR THE BROWN CO., BERLIN, N. H., BY THE ELECTRIC FURNACE CONSTRUCTION CO., PHILADELPHIA, PA.

22,000-Volt Electric Steam Boiler

A unique installation was recently placed in operation in the Berlin, N. H., plant of the Brown Company, pulp, paper and chemical manufacturers. It is an electric boiler of 18,000 kw. (1,800 boiler-horsepower) rated capacity operating at 22,000 volts, three phase, sixty cycles, 135 lb. gage pressure, and producing 50,000 lb. of steam per hour. It displaces 69 long tons of coal in 23 hours, worth $550 under the boilers.

The boiler consists of three vertical tanks, each 84 in. in diameter and 82 in. high between heads. It occupies a floor space 25 ft. 6 in. long by 8 ft. 2 in. wide, and is 15 ft. 6 in. high from the floor to cable terminals. It requires total headroom of 24 ft. from the floor to allow sufficient space for the removal of electrodes. A space 10 ft. long by 5 ft. wide is also required to install the oil switches and barriers.

The boiler, which was built by the Electric Furnace Construction Co., of Philadelphia, Pa., was installed for use only 23 hours on Sundays and other holidays, when the mill is shut down with the exception of sulphite digesters and other apparatus requiring steam every day.

The Brown Company wanted a large electric boiler to make use of all surplus power and believed at first that a lower voltage would have to be employed. But after discussing this question with the builders, it was agreed that the expense of step-down transformers could be avoided if a boiler could be made to operate successfully at 22,000 volts. The transformers would have cost twice as much as the boiler. It was recognized by both companies that no such boiler had ever been built or ever attempted and that certain difficulties might be encountered which, unless overcome, might in the end make it necessary to employ a lower voltage, as originally contemplated. None of the difficulties which there seemed reason to expect materialized, and the successful operation of this boiler is very gratifying to designers and users. The difficulties which were anticipated were:

1. Insulation of the conductors where they enter the tanks. No trouble whatever was experienced.

2. Inability to operate at low load. In the first place the Brown Company desired to operate this boiler principally on Sundays and other mill holidays and then at full load. However, in times of power shortage due to low water, it is desirable to use whatever power is available. It was found that the boiler operates quite as well at one-quarter load as at full load.

2. Rapid wear of electrodes. Actual results were most gratifying. Observations of the electrodes indicate that they will last 5 years, if used 60 days per year. But it is evident that the greatest wear occurs when the boiler is started and when shutting it down, due to arcing when contact with the water is made and broken. It is probable, therefore, that they would last a full year in continuous operation or with a comparatively small number of interruptions.

The cost of the installation was $25,000. Thus the boiler will have returned its entire capital cost in 46 days of 23-hour operation by the cost of the coal which it displaces.

While the number of places where large blocks of surplus power are available for this purpose is limited, there are a great many cases where smaller quantities of hydro-electric power are constantly going to waste through low load during the working day, and not used at all nights, Saturday afternoons, Sundays and other holidays. In other cases blocks of power are bought and paid for by the year, whether used or not. Control systems have been worked out whereby electric boilers can be caused automatically to absorb surplus power at any time to produce steam or hot water and automatically to release the whole or any part of such power when the normal uses of a mill again require it. These automatic controls can be adapted to meet almost any kind of conditions. Hand-operated electric boilers yield a very handsome return on their cost and when equipped with automatic control so that they will constantly "float" on a system increase still more their earning power wherever there is a use for steam or hot water.

Catalogs Received

MAGNUS, MABEE & REYNARD, INC., 257 Pearl St., New York, N. Y.—A new catalog of the various edible and essential oils sold by this company, including revised prices on its products for the fall of 1923.

HERCULES CARBOY BOX CO., Newark N. J.—A folder describing the Hercules carboy box, a box in which a carboy is tightly held without the use of hay or other packing.

SHARPLES SPECIALTY CO., Philadelphia, Pa.—A bulletin describing the methods of resolving an emulsion into its components by means of the Sharples process.

ELYRIA ENAMELED PRODUCTS CO., Elyria, O.—Bulletin 31. A new bulletin describing the line of enameled equipment manufactured by this concern for the chemical, pharmaceutical and allied industries. This bulletin gives specifications for the various types of equipment and also the space which the equipment will occupy.

BAKER & CO., INC., Newark, N. J.—The fourteenth addition of the Baker & Co. general catalog entitled "Data Concerning Platinum."

SWENSON EVAPORATOR CO., Harvey, Ill.—Bulletin C-223. A bulletin entitled "Swenson-Walker Continuous Crystallizers." This bulletin describes the construction, installation and operation of this equipment for crystallizing.

Readers' Views and Comments

An Open Forum for Subscribers

The editors invite discussion of articles and editorials or other topics of interest

Petroleum as a Chemical Raw Material

To the Editor of Chem. & Met.:

SIR—It is not for any personal reasons that I call attention to errors in your report of my paper on "Petroleum as a Chemical Raw Material," delivered before the Division of Organic Chemistry at the Milwaukee meeting and reported in your issue of Sept. 24. Dr. Faragher stated that the large refining losses experienced in the Scotch shale-oil industry and to which I referred have no counterpart in the American petroleum industry, which fact is of course well known to petroleum technologists, but perhaps not to others. Your account would indicate, however, that I had cast aspersions on the work of the American petroleum chemists and that these remarks "drew a rejoinder" from Dr. Faragher. Although the time which remained, after a prolonged program, was wholly inadequate for the proper presentation and discussion of the subject, I was particularly careful to point out that although chemistry had played no great part in building up the petroleum industry, the leaders of the industry are now giving more interest and support to investigation in this field than ever before.

But we can quickly dispel this interest by continuing to confuse *testing* of petroleum products as it is now done with *petroleum chemistry*. Much of this testing is of little real importance. As Frank Howard stated last year before the symposium of the American Petroleum Institute on the question of "What Is Good Gasoline?": "A good gasoline is any gasoline which the public will buy." However, one familiar with the buying and selling of petroleum products realizes that these tests have some value, and they certainly cannot be dispensed with.

The point is that testing has nothing to do with the real chemical problems of petroleum or the chemical possibilities inherent in it. Thus the tester takes the specific gravity of a certain fuel oil and passes it along, but an organic chemist may ask, "Can we put this oil to a better use than merely to burn it as fuel?" It is not my purpose to find fault in any way with the testing of petroleum products but rather to show that there is much more to the picture, and if by research the organic chemist can gradually open up greater opportunities and create a greater diversity of petroleum products, the men now held down by routine testing may have a much wider field of work and infinitely greater opportunities for advancement. I have seen certain refineries so operated that the chemist had little more to say regarding the operation of the plant and its major problems than a Swiss clock cuckoo, and why deny that this condition exists? It may be unwise to inquire too closely as to why such conditions exist, but if we all pull together with the proper regard and respect for the functions and contributions of all of the workers in this great industry, we can place the science of chemistry on an entirely new level of relative importance.

We are so accustomed to viewing all industry from our own particular standpoint as chemists that we are apt to overlook or belittle the work of others, and we frequently undervalue the art of industry. I use the term "art" in the sense of the accumulated experience of industry and it sometimes happens that the only contribution that science can make is to give us a scientific explanation of the facts already known. It should not be a heresy to say that the petroleum industry today cannot properly be considered a chemical industry. It is true that one can find a few stray chemical facts in petroleum refineries, but this is equally true of a wire nail factory or a bolt and nut works. It is, of course, true that we are living in a material, *chemical*, world. The farmer plows a chemical soil, raises chemical turnips, and his chemical hens lay chemical eggs. The chemist has done a good deal for the farmer and we hope that even more can be done for the petroleum industry, but we only create difficulties and misunderstandings for ourselves when we put our label on the industry and assume the major credit. Rather give due credit to the oil geologists and even the drillers who find the oil, to the engineers who transport it, the refiners who distill it, and also to the men who finance it, and the able executives who manage the whole intricate business. We will then have a much better chance to get into the harness and by research in the industry itself, and by scientific leadership by our university friends, to make it in fact more of a chemical industry than it is today. It is, of course, true that rarely a chemist rises to a conspicuous executive position, but not until long after he has broken through his chemical shell; and without casting any reflection upon either party, it may be noted that office boys rise occasionally to equally high places.

Also your brief account noted my statement that most of the refiners' operations and problems are really problems of physics. This is not an opinion, but a fact. However, your report seemed to miss the point. These facts were not cited to put a wet blanket on the chemists' enthusiasm, but since the chemist is the only scientifically trained man to whom the refiner can turn for assistance in solving his technical problems, it behooves us to look at these matters broadly and not handicap ourselves by limiting our efforts to accord with a too narrow definition as to what a chemist is.

However, the principal theme of my discussion is that we have not progressed far enough in the theoretical or rather systematic organic chemistry of the higher hydrocarbons. This is a field of investigation which the petroleum companies themselves are hardly justified in carrying out in their own laboratories on account of its great expense and the very small probability of turning such work to practical account within a reasonable time. Such work would really be pioneer work and would inevitably react in many ways to the benefit of the industry, and, as Prof. Kremers pointed out, this should be the function of the university organic chemist.

BENJAMIN T. BROOKS.

New York City.

EDITOR'S NOTE—We are glad to publish Dr. Brooks' criticism of our report of his paper before the Division of Organic Chemistry at the Milwaukee meeting of the A.C.S., although we believe we reflected accurately the impression he created. Doubtless there are chemists who will not agree with all of Dr. Brooks' statements, and we shall be glad to open our columns to a discussion of the subject.

Exigencies of Management in the Ruhr

Following is an extract offered for publication from a personal communication to one of the editors of *Chem. & Met.* from Dr. Franz Meyer of the Th. Goldschmidt Corporation, transmitted from Heidelberg, Germany, through the New York office of his company.

"A decision of the French court-martial in Landau, Palatinate, against the managers of the Badische Anilin und Sodafabrik in Ludwigshafen on the Rhine.

"In compliance with the German laws, the gentlemen had refused to assist the French army of occupation in carrying off the large stocks of nitrogen fertilizer which the French had seized in Oppau.

"For this reason the French court-martial in Landau passed the following judgments:

"Dr. Julius and Dr. von Knieriem, 10 years' imprisonment each.

"Dr. Bosch, Dr. Michels, Dr. Schuon, Dr. Bueb, Dr. Schmitz and Dr. Warmbold, 8 years' imprisonment each, besides a fine of 150,000,000 marks for each manager.

"According to a German saying, the citizens of old Nuernberg did not hang anybody unless they had him, and it is a consolation that the French cannot put anybody into jail unless they have him. After Mr. Krupp's and his co-directors' experience with a French court-martial, the managers of the Badische Anilin und Sodafabrik did not appear before the court, and they are

not foolish enough to present themselves to the French for imprisonment.

"How would the managers of the Allied Chemical & Dye Corporation or of any other American company like to work under conditions as illustrated by the decision of the French court-martial?"

For a Chemical Exposition in Philadelphia in 1926

To the Editor of Chem. & Met.:

SIR—No matter what of interest or gain a visitor carried away from the Ninth National Exposition of Chemical Industries held in Grand Central Palace in New York during September last, one impression was dominant—it was largely a display of apparatus and equipment and not an exposition of American chemical industries. However, it was because the manufacturers of apparatus and equipment spent their money as they did that any show at all was possible and most of us are willing to concede that when someone spends a dollar he is entitled to choose what he buys with it. When one considers how little of support was afforded the exposition other than that which came from the manufacturers of apparatus and equipment, it must be conceded that the Ninth National Exposition of Chemical Industries was an excellent exhibition. Certainly those who had made it possible were for the most part well satisfied with their returns.

The most common criticism leveled at the recent exposition was that it contained little that was of popular interest or calculated to enhance the prestige of American chemical industry. The noteworthy exception to this was the booth of American Chemical Society. Here the high spots of just seven industrial developments brought about by chemical research were shown, but, limited in scope though it was, this exhibit not only pointed the way to new possibilities for technical men but also did much to enhance the prestige of chemistry in the opinion of the general public.

In Philadelphia in 1926 the 150th anniversary of the signing of the Declaration of Independence will be celebrated by an exposition that will last 6 months. Get together every interest whose desire it is to see American chemical industry continue to expand, not only those that are grouped as chemical manufacturers but also those industries that are the product of applied chemistry and physics—steel, cement, fertilizers, glass, ceramics, to name but a few—and then you will have a real exposition of American chemical industry that will give the whole world a picture of what our science is doing for America.

Suppose the sulphur producer, the sulphuric acid manufacturer, the by-product coke-oven operator, the fertilizer manufacturer and the maker of breakfast foods co-operated to show by models, photographs and samples how the chemist had served each of them and so made possible the products all know. Would not such an exhibition have a high quality of interest not only for technical people but also for the general public, which would learn how co-ordination of effort among industries is achieved by the chemist?

Amplify this thought. Is it not practicable to have an exposition of American chemical industries which, starting with basic raw materials, will show progressively how they are evolved into the common things of everyday life through the magic of chemistry? Start with the most essential and fundamental materials in each field and build a framework of our American chemical industry on which to hang shining examples of accomplishment in any part, somewhat in the same manner that an anatomical chart is assembled. By illustration show the influence of chemistry on building materials, food, fabrics, health, transportation and communication, and there will be no cause for any complaint thereafter that the importance of chemistry is not recognized.

Equipment and apparatus manufacturers would not be excluded from an exposition such as is suggested, but instead of their exhibits being shown so that they have but little significance to the lay mind, their products would appear in place to show exactly how they contributed toward the results that are achieved by chemical industry as a whole.

If we are to hasten the day when physicists, chemists, chemical engineers and American chemical industry come into their own in public esteem and appreciation we must quit knocking and instead adopt the motto of the Three Musketeers: All for One—One for All.

PAUL MCMICHAEL.

New York City.

Cost of Patents in Foreign Countries

To the Editor of Chem. & Met.:

SIR—In my article "Useful Facts About Applying for a Patent" in your issue of Sept. 3. 1923, I stated that approximately $500 was the cost of taking out a patent in the United States. In view of the fact that a general idea of the approximate total cost of a patent in each country is useful, I have prepared a table from data obtained from several hundred patents taken out in foreign countries.

The first column gives the name of the country. The second column represents the total tax for the duration of the patent, including the foreign correspondent's cost of making out the necessary papers. The third column is the so-called "working" charge; this may be partly a governmental fee and partly the cost of advertising the patent for sale and the cost of meeting other requirements of the law. The figure given is an average value. The last column gives the average total cost; this includes not only the cost of professional services, taxes and working charges but all other items of expense.

WHAT IT COSTS TO TAKE OUT A FOREIGN PATENT

Country	Taxes	Average Working Charges	Average Total Cost
Argentina	$120	$125	$450
Australia	32	350	560
Austria	940	385	1,500
Belgium	480	390	950
Brazil	662	420	1,280
Canada	40	....	175
Chile	....	270	640
Cuba	....	40	180
Denmark	627	360	1,270
England	654	....	870
France	403	180	710
Germany	1,327	....	1,510
Holland	635	480	1,520
India	305	300	730
Italy	351	180	660
Japan	163	120	490
Mexico	....	....	135
New Zealand	51	300	490
Norway	337	....	510
Panama	....	45	340
Peru	....	150	410
Philippines	....	....	75
Porto Rico	....	....	75
Portugal	125	210	440
Spain	493	425	1,050
Sweden	259	....	440
Switzerland	312	385	820

It should be remembered that these figures are not to be compared with the $500 estimated as the cost of a United States patent, because these figures for foreign patents presuppose that the application has already been taken out in the United States. In other words, a large amount of the hard work has been done, and the filing in a foreign country means little new thought or consideration. Taking this into account, after looking over this table, one reason can be easily seen why the United States Patent Office is the largest and most popular patent department in the world.

D. B. KEYES.

New York City.

Calendar

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, seventy-fifth anniversary meeting, University of Cincinnati, Cincinnati, Ohio, Dec. 27 to Jan. 2.

AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, Oct. 15 to 20.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, winter meeting, Washington, D. C., Dec. 5 to 8.

AMERICAN MANAGEMENT ASSOCIATION, Hotel Astor, New York, Oct. 29-31.

AMERICAN PETROLEUM INSTITUTE, fourth annual meeting, Statler Hotel, St. Louis, Mo., Dec. 11 to 13.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, annual meeting, New York City, Dec. 3 to 6.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, annual convention, New York City, Dec. 3 to 5.

AMERICAN WELDING SOCIETY, fall meeting, Pittsburgh, Pa., Oct. 24 to 26.

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATION ENGINEERS, fourteenth annual convention, Memphis, Tenn., Dec. 12 to 16.

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Grand Central Palace, New York, Dec. 3 to 8.

SOCIETY OF AUTOMOTIVE ENGINEERS, annual meeting, simultaneously with the Detroit Automobile Show, General Motors Bldg., Detroit, Mich., Jan. 22 to 25, 1924.

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, Appleton, Wis., Oct. 25 to 27.

Review of Recent Patents

Hydrogen Production

Iron-Steam Process Modified to Allow More Even Heating of Reaction Mass

The production of industrial hydrogen by the alternate reduction and oxidation of heated iron or iron ore by means of reducing gases and steam, respectively, entails a number of operating difficulties. The retorts containing the iron reaction mass must be heated to a fairly high temperature. If this is done externally with the gases from the reduction phase (which still contain considerable combustible gas), a very complicated equipment is required. It has been suggested that direct or internal heating of the mass or a combination of internal and external heating might be desirable. In most of such cases, however, the heating is intermittent—that is, it ceases during the oxidation phase of the reaction.

Arthur R. Griggs, of Bromley, England, has been granted a patent for a process involving the use of a combination of closed retorts continuously heated externally and intermittently heated internally by use of the gases resulting from the reduction phase. By working with an apparatus consisting of two groups of retorts or chambers it is possible to divide the reduction phase into two periods. The first period of reduction in one group may be effected concurrently with or immediately following the internal heating by gases resulting from the later period of reduction in the other group. The final period of reduction is effected by the passage of the reducing gas alone through the reaction material. The equipment for carrying out this reaction is fully described in the patent specification 1,466,619, issued Aug. 28, 1923.

Separating Paraffine Wax

Application of Centrifugal Force Permits Use of Smaller Plant and Simplifies Refrigerating

In the refining of paraffine base crude oils there is left, after distilling off the more volatile products, a residue commonly known as cylinder stock or bright stock. To remove the wax from this stock (or from the wax distillates as well) refrigerated brine is used to throw the wax out of solution and it is separated by filtration or settling. If naphtha has been added to accelerate this separation, it must necessarily be removed by subsequent distillation.

An objection made to the settlement and filtration processes is that they involve large quantities of stock which take up much room and require enormous refrigerating facilities. C. H. Hapgood of the De Laval Separator Co. proposes to separate the wax from the oil by the following combination of refrigeration and centrifugation: The stock is subjected to two successive refrigerating treatments to throw the wax out of solution. The oil and precipitated wax are then subjected to centrifugal force in a centrifugal separator that separately discharges the oil-free wax and the wax-free oil. The first refrigerating treatment consists in using the wax-free oil to absorb heat from the original stock. The second refrigeration is accomplished by direct expansion of ammonia. (1,464,707; issued Aug. 14, 1923.)

Manufacture of Coated Fabrics

A Coating Machine Is Described for Which Continuous Operation and Other Advantages Are Claimed

The actual spreading of a pyroxylin composition on a fabric for the production of artificial leather is comparatively simple, yet it involves a number of interesting mechanical problems. A continuous process by which several successive coats can be applied to a bolt of cloth without stopping or reversing the coating machine is one important desideratum. Another is to provide adequate means of drying and fume removal so as to protect the operator from excessive exposure to the solvent vapors.

John Alexander Wilson, in a recent patent assigned to the Duratex Corporation of Newark, N. J., describes a coating machine designed to accomplish these objects. This machine is shown in the accompaying figure. To operate the machine the web of the fabric, *W*, to be coated is fed over the feed roll 41 to the creeping conveyor, 46. The web is passed from the conveyor over idler rolls 49 and 50, under idler roll 51, through slot 60, and thence to the tension roll 30, the surface of which is provided with carding clothing. The web passes around the tension roll 30, under idler roll 29, over idler roll 28, and under the doctor or spreading knife 11. From the knife the web passes directly to the upper stretch of the drag belt 27, the entire surface of which between rolls 14 and 19 grips the web and pulls it beneath knife 11. From the drag belt 27 the web passes through slot 58, into

American Patents Issued October 2, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and whose which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,469,209—Apparatus for Hydrating Lime. D. Bone, Oglesby, Tex.

1,469,223-5 — Casting-Ladle Mechanism. James B. Ladd, Ardmore, Pa., assignor to United States Cast Iron Pipe & Foundry Co., Burlington, N. J.

1,469,230—Centrifugal Separating Apparatus. James MacKaye, Cambridge, Mass.

1,469,275—Apparatus for Electrical Precipitation of Suspended Particles From Gases. E. Möller, Brackwede, and W. Hoss, Bad Homburg, Germany, assignors to International Precipitation Co., Los Angeles, Calif.

1,469,294—Drier. A. C. Daman, Denver, Colo.

1,469,327—Apparatus for Charging Reverberatory Furnaces. A. G. McGregor, Warren, Ariz.

1,469,362—Process for the Treatment of Wood Material and the Product Thereof. V. H. Forssman, Cologne, Germany.

1,469,370—Mixing and Beating Machine. H. Trust, Park Ridge, N. J., and E. M. Ashley, Brooklyn, N. Y.; said Ashley assignor to J. Trust, Park Ridge, N. J.

1,469,373-4—Manufacture of Wrought Iron. J. Aston, Pittsburgh, Pa., assignor to A. M. Byers Co., Pittsburgh, Pa.

1,469,380—Drawing Continuous Sheet Glass. R. P. Callard, Charleston, W. Va. assignor to Libbey-Owens Sheet Glass Co., Toledo, Ohio.

1,469,383—Method of and Apparatus for Producing Continuous Sheet Glass. J. P. Crowley, Toledo, Ohio, assignor to Libbey-Owens Sheet Glass Co., Toledo, Ohio.

1,469,399—Gas Producer. Francis H. Treat, Cleveland, Ohio, assignor to Duff Patents Co., Pittsburgh, Pa.

1,469,426—Process for Reclaiming Used Oil. J. R. Miller, Pittsburgh, Pa.

1,469,447—Absolute Alcohol. J. Schneible, Chicago, Ill.

1,469,457—Manufacture of Glassware. R. Good, Washington, Pa.

1,469,460—Crushing and Separating Machine. G. Strizzi, New Castle, Pa.

1,469,466—Production of Creosote Mixture for Impregnating Wood. I. F. Vermeire, Brussels, Belgium.

1,469,475—Method of Evaporation and Apparatus Therefore. E. Wirth-Frey, Aarau, Switzerland.

1,469,491—Coking Retort Oven. J. van Ackeren, Pittsburgh, Pa., assignor to Koppers Co., Pittsburgh.

1,469,499—Hydraulic Press and the Like. J. I. Creigh, Sheffield, England, assignor of one-third to Cammell Laird & Co., Ltd., and one-third to J. M. Allan.

1,469,507—Extraction of Potassium Compounds. W. Glaeser, Brooklyn, N. Y., assignor to Potash Extraction Corporation, New York.

1,469,522—Centrifugal Separating Apparatus. J. MacKaye, Cambridge, Mass.

1,469,552 — Registering Thermostat. R. S. Burdette, Akron, Ohio, assignor to Goodyear Tire & Rubber Co., Akron.

1,469,563—Process of Making Emulsified Compositions. L. Kirschbraun, Evanston, Ill.

1,469,581—Method of Supersaturating Liquids. B. Brazelle, Los Angeles, Calif., assignor to Aquazone Laboratories, Inc., Los Angeles.

1,469,586—Production of Hydrazanisol. R. A. Nelson, Buffalo, N. Y., assignor to National Aniline & Chemical Co., Inc., New York.

1,469,628—Treatment of Oil Shale. R. C. Dundas, Los Angeles, and R. T. Howes, Santa Maria, Calif.

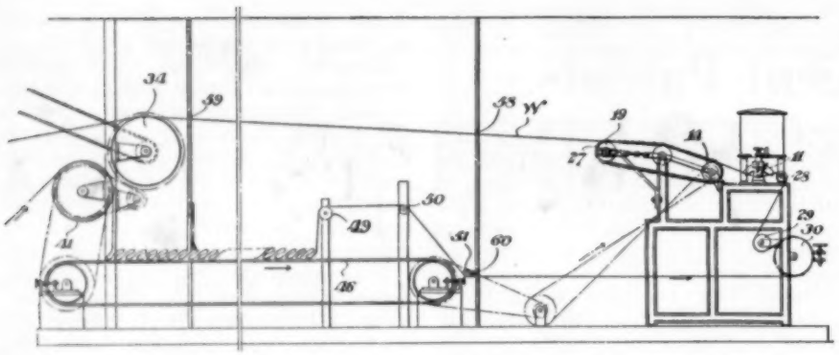
1,469,644-5—Burning Sulphur. W. H. Kobbé, New York, N. Y., assignor to Texas Gulf Sulphur Co., Bay City, Tex.

1,469,706—Method of Treating Molten Metals. C. Vos, New York.

1,469,744—Process of and Apparatus for Preparing Cane for Extraction. E. Wessale, Waconia, Minn.

1,469,756—Apparatus for Transporting Gases. P. E. Haynes, Buffalo, N. Y., assignor to Linde Air Products Co.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.



the drier and through slot 59, from the drier to the drag roll 34, the surface of which is covered with carding clothing. From the drag roll 34 the web may pass from the machine, as shown, or it may pass directly back to the creeping conveyor 46, if another coating is to be applied to it.

It will be noted that the pull which carries the fabric under the knife is supplied by the drag belt 27, which is close to the knife and therefore this tension does not exist through a long stretch of the fabric. The drag roll 34 supplies the pull necessary to carry the fabric through the drier. This pull is comparatively slight and hence the long stretch of fabric between belt 27 and roll 34 does not result in any disadvantage. The fact that the drag belt 27 acts on the fabric in the rear of and near to the knife to pull the fabric under the knife enables this machine to operate on a light weight fabric without injuring it.

It will be observed that the machine is continuous in its operation and that the coating operation does not need to be suspended while a coated batch is taken off or a fresh batch is fed to the machine. In work of the character for which this machine is intended—for example, applying a pyroxylin coating to a fabric—solvents are frequently used in the coating composition which are volatile and give vapors which are injurious or unpleasant to the workmen. (1,457,413; issued June 5, 1923).

Men in the Profession

C. MERRILL BROWN, industrial chemist at the local plant of the American Linseed Co., Buffalo, N. Y., and associate professor of chemistry at the University of Buffalo, will conduct evening sessions at the institution during the coming season, covering a course in organic chemistry. He is a graduate of Williams College, where he took a Master of Arts degree in 1917.

RICHARD B. CHILLAS, chemical engineer, has resigned from the National Aniline & Chemical Co., Buffalo, N. Y., and is now with the Atlantic Refining Co., 3144 Passyunk Ave., Philadelphia, Pa.

EDMUND DEFOREST CURTIS has been appointed a member of the instruction staff at the Philadelphia School of Industrial Art, and will conduct courses in pottery and ceramics.

E. F. DANIEL, JR., and J. H. BRODIE have been elected vice-presidents of the American Agricultural Chemical Co., New York. J. D. CAMERON BRADLEY and A. P. STEMM, vice-president and treasurer, respectively, have resigned.

GERALD H. MAINS has recently resigned as associate chemist, Color Laboratory, U. S. Bureau of Chemistry, to accept a position as a chemical engineer with the Westinghouse Electric & Manufacturing Co.

HERMAN NAGEL has opened an office at 208 South LaSalle St., Chicago, Ill., to engage as a consulting chemist. He was formerly connected with the American Sugar Refining Co.

W. R. RENOUF has been appointed general manager of the Niloak Pottery Co., Benton, Ark.

WILHELM SEGERBLOM, head of the department of chemistry at Phillips-Exeter Academy, Exeter, N. H., is secretary of the commission which the College Entrance Examination Board has appointed to revise the definition of the requirement in chemistry.

PAUL M. TYLER, chief of the metals section of the United States Tariff Commission, has resigned.

GEORGE UPTON has resigned as general manager of the American Glue Co., Boston, Mass., effective at once, and will continue with the organization as one of the vice-presidents.

The Utah-Idaho Sugar Co., Salt Lake City, Utah, has announced changes in the chemical department of its organization as follows: S. C. Gaddie, for a number of years situated at the Sugar City, Utah, laboratory, has been appointed chief chemist at that works, succeeding J. C. Keane, who has been transferred to the same position at the Toppenish, Wash., refinery. E. O. Miller, chief chemist at the Delta plant of the company, has been transferred in the same position to the plant at Shelley, Utah. W. A. Jackman, heretofore assistant chemist at the Elsinore, Utah, refinery, has been appointed chief chemist at the plant, succeeding Mr. Petrie, who will act in the same capacity at the Payson, Utah, refinery. R. L. Howard has returned to the employ of the company and has been appointed chief chemist at the Lehi City, Utah, refining plant. Arthur Webb, heretofore chief chemist at the Garland, Utah, refinery, has been appointed assistant superintendent at the Blackfoot, Idaho, plant. Harvey Greenwood will act as chief chemist at the last-noted plant and S. D. Kellerman has been appointed chief chemist at the West Jordan, Utah, refinery.

M. R. WALKER, a mining engineer of Pittsburgh, has been appointed special expert in charge of the non-ferrous division of the metals section of the United States Tariff Commission. Mr. Walker is a graduate of the Michigan College of Mines.

Important Articles in Current Literature

More that fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

HEAT RECOVERY FROM MACHINE ROOM VAPOR. J. O. Ross. In the paper mill, exit air from the machine room ordinarily carries out a large amount of heat. The use of a Briner counter-current economizer for preheating incoming air with the exit air is here described. *Paper Trade Journal*, Oct. 4, 1923, pp. 47-49.

RINMAN PROCESS FOR LIQUORS. Emil Heuser. Method devised in Germany yields numerous byproducts of considerable value. Its application is to the soda process. Details of operation and results obtained in practice are given. *Paper*, Oct. 3, 1923, pp. 3-6.

NEW EXPERIMENTS WITH REPEATED SHOCKS. Leon Guillet. The influence of cold-drawing is shown to be considerable, especially on ductility. A comparison is made of the effect of tempering and cold-hammering on mild steel. *Iron Age*, Oct. 4, 1923, pp. 890-891.

LES INDUSTRIES DU CUIR. G. Manquat. The first of a series of articles outlining the present status of the chemical engineering industries in France, this paper gives a brief review of French leather tanning practice. *La Technique Moderne*, Sept. 15, 1923, pp. 560-563.

SOME ASPECTS OF THE PHYSICAL CHEMISTRY OF INTERFACES. Prof. F. G. Donnan. Address delivered by president of chemistry section of British Association for the Advancement of Science, in which an earnest plea for getting together on the fundamental facts of science is made and a detailed study of these is presented. *Chemistry & Industry*, Sept. 21, 1923, pp. 892-900.

RELATIONS BETWEEN COMPOSITION AND PROPERTIES OF ENAMELS FOR SHEET STEEL. R. R. Danielson and B. T. Sweely. Boric oxide, replacing sodium oxide in enamels, increases coefficient of expansion, while scaling decreases with increases in sodium oxide. *Jour. Am. Ceramic Soc.*, October, 1923, pp. 1011-1029.

FUEL OIL AS ADAPTED TO CHAMBERED CONTINUOUS KILN. Mark A. Taylor. Summary of equipment used and methods employed in firing a Youngren type kiln with fuel oil. *Jour. Am. Ceramic Soc.*, October, 1923, pp. 1056-1061.

News of the Industry

Summary of the Week

Final arguments on nitrite of soda import duty were heard by Tariff Commission on Oct. 6.

Production of acetate of lime in August was lower than in July, but methanol output showed increase.

Chief of Department of Agriculture plans to utilize agricultural wastes in production of industrial alcohol, acetic acid, etc.

National Wholesale Druggists Association advocates appointment of commissioner to supervise trade in industrial alcohol.

Chilean Government may sell nitrate lands in order to raise revenue.

Final arguments in suit of the government against the Chemical Foundation heard in District Court at Wilmington, Del., by Judge Hugh M. Morris.

National Fire Prevention Exposition at New York brings together wide variety of fireproofing, protection and indicating equipment.

A.C.S. local sections becoming active in many sections of country with on-coming of winter season.

Royal Commission finds most of testimony in pulpwood hearing opposed to embargo.

President Coolidge may call for conference aimed to abolish pollution of waters by oil.

Druggists Favor Separate Commissioner To Supervise Industrial Alcohol Trade

Would Establish Industrial Alcohol Division as Protection Against Overzealous Prohibition Enforcement

OPPOSITION to the Ernst-Wood bill, "conferring autocratic powers upon the Prohibition Commissioner," was urged in the report of the special committee on prohibition problems presented to the annual meeting of the National Wholesale Druggists Association at Cleveland on Wednesday.

The committee, of which William Jay Schieffelin of New York is chairman, asked every member of the association "to favor a division of the Prohibition Commissioner's authority by the appointment of a second commissioner familiar with industrial practices, having a technical knowledge of the use of industrial alcohol, with the duty of supervising legitimate industry." The report added:

"The purpose of the prohibition law is twofold: First, to restrict the use of intoxicating liquors to medicinal and sacramental purposes, and second, to insure an ample supply of non-beverage alcohol and promote its use for scientific research and in the development of fuels, dyes and other lawful products.

"Experience has shown that there should be a separation of the functions of the supervision of alcohol for industrial purposes from those of policing violations of the prohibition law. The Prohibition Commissioner, whose powers are delegated to him by the Commissioner of Internal Revenue, apparently felt it his duty to enforce the prohibition law regardless of its effect upon the lawful use of alcohol.

"As alcohol is a vital ingredient in many pharmacopœia and other medicinal preparations, it became repeatedly necessary for representatives of the wholesale drug trade to appeal to the Commissioner of Internal Revenue to modify regulations made by the Prohibition Commissioner."

Advisory Committee Commended

One of the biggest achievements of the year, the committee pointed out, was the appointment by the Commissioner of Internal Revenue of an Alcohol Trades Advisory Committee composed of representatives of the American Chemical Society and national associations in trades employing alcohol to confer with the officials of the Internal Revenue Bureau and Prohibition Unit whenever it is proposed to issue new regulations or rulings of interest to the trades handling or using alcohol.

The wisdom of the appointment of the committee has been demonstrated in connection with the revision of Regulation 60, the code covering producers, distributors and users of non-bererage alcohol, according to the report of the committee on legislation, headed by W. L. Crounse of Washington, D. C.

Widespread reforms will be brought about by these regulations, according to this committee, which predicted the elimination of hardships to manufacturers and dealers resulting from the careless manner by which stocks of alcoholic preparations have been sampled by inexperienced prohibition officials and analyzed by overworked laboratory assistants.

"It is submitted," said the committee, "that no reputable permit holder should be subjected to such annoyance and expense upon evidence no more conclusive than the single analysis of a single sample. Under the new system field agents will be instructed to obtain duplicate samples of live stocks from responsible representatives of manufacturers or dealers and a sufficient number of analyses will be made to determine the exact character of the goods. In a general way the method followed will be that pursued by the Bureau of Chemistry in the enforcement of the pure food and drugs law.

"The discovery by the advisory committee that basic permits issued to manufacturers are not required to be renewed annually was a notable achievement. The necessity for renewing all permits annually has proved such a burden to the Prohibition Unit that a large percentage of the permit holders have operated for from 6 to 10 months under last year's permits, while at this writing it is an astonishing fact that a considerable percentage of permit holders are doing business under a 1922 permit, and in a few instances operations are being carried on under a permit issued for the year 1921.

"By eliminating more than 50 per cent of the outstanding permits from the necessity of being renewed annually the Permit Division will find its force entirely adequate to handle the remaining permits with an unprecedented promptness. In connection with the new rulings requiring applications for renewals to be filed between July 1 and Aug. 31 there is every reason to believe

that it will be possible for the bureau to issue at least 90 per cent of current renewals before the end of the first quarter of the new calendar year."

Necessity for Industrial Commissioner

Dwelling upon the necessity for an industrial commissioner, the committee on legislation said:

"Instead of granting more authority to the Prohibition Commissioner, sentiment is rapidly crystallizing in favor of a division of this authority, leaving to the Prohibition Commissioner the supervision of law violators and vesting in an official of equal rank the duty of supervising legitimate industry and protecting it against the encroachment of overzealous prohibition enforcement.

"One of the inherent weaknesses in the present organization of the Prohibition Bureau is the fact that the same men who are charged with the policing of law violations, including the pursuit of the illicit distiller, the smuggler and the bootlegger, also have complete control of the supplies of non-beverage alcohol for legitimate use and supervision of the plants and premises of legitimate dealers and consumers.

"One of the most lamentable results of this condition is the constant effort on the part of the authorities to restrict the use of alcohol for the purpose of making a showing of efficient enforcement of the prohibition law.

"The officials of the Prohibition Bureau have made no secret of their efforts to reduce alcohol consumption, but they have ingeniously sought to make it appear that the restrictions imposed on alcohol consumers have been designed solely to prevent illegitimate diversion. Occasionally, however, in bursts of enthusiasm regarding their own efficiency, the highest officials of the bureau have frankly thrown off the mask and told the real truth concerning their objects."

Glue Manufacturers Provide for Co-operative Investigations

The growing importance of glue as an engineering material and its increasing industrial application has prompted the National Association of Glue and Gelatin Manufacturers to establish co-operative relations with the Bureau of Standards in Washington. Dr. V. H. Gottschalk, who was formerly director of research for the American Cotton Oil Co. and its subsidiaries and has since been connected in a similar capacity with other large industrial organizations, was selected to represent the association and since March 1 has made his headquarters at the bureau. The co-operative work consists in co-ordinating the investigational effort now being expended on the standardization of glue and gelatin, the determination of fundamental properties and the study of methods of evaluation. Attention is also given to difficulties arising in the use of glue and gelatin and it is planned to investigate new industrial applications for these products.

Final Nitrite of Soda Hearing Centers On Authority of Tariff Commission

Held That Commission May Not Point a Conclusion—Must Submit Report Based on Field Work and Hearings—Cross-Examination Objected To

FINAL arguments were presented before the Tariff Commission Oct. 6 in the application of the American Nitrogen Products Co., of Seattle, Wash., for an increase of 50 per cent in the duty of 3c. per pound on sodium nitrite.

The arguments developed along the lines not of the facts and evidence developed in the investigation of this case, but of the powers of the commission in cases arising under the terms of the flexible provisions of the 1922 tariff act.

Judge Marion DeVries, counsel for the opposition, which was entered by the Norwegian Nitrogen Products Co., selling agent for the Norsk Hydro interests of Norway, was denied his request that the commission make public, or available to the opposition, additional data gathered by the agents of the commission in their investigations. The commission also refused permission for introduction of a cablegram received from the Norwegian producers, holding that the hearing had been concluded and that arguments only were in order. The Norwegian producers refused to give agents of the commission their costs of production, and estimates were made which the importing interests claim are too low but which they have not met by actual figures under oath.

Former Senator P. J. McCumber, joint author with former Representative Fordney of the 1922 tariff act, appeared as counsel for the American Nitrogen Products Co. Senator McCumber argued mainly about procedure which he suggested the commission follow under the flexible provisions. He declared that the commission has no authority to point a conclusion to the President, but must confine its duties to investigations and submission of a report, based on field work and hearings. He declared Congress has eliminated broader authority contained in the original draft of the sections which would have given the commission the power to direct changes in duties. Senator McCumber also argued that the President is not bound to accept the findings of fact of the commission, but may call upon any other agency for additional reports or advice. He further asserted that the commission should not permit witnesses at public hearings to be cross-examined by parties at interest or their representatives.

Judge DeVries agreed that the report of the commission is not binding upon the President, and that the Executive may get additional advice. He asserted that cross-examinations, however, were proper.

du Pont May Erect Linseed Oil Factory

With a view to reducing the cost of its basic raw materials the paint department of E. I. du Pont de Nemours & Co. is considering the erection of a large linseed oil factory at its Philadelphia plant. Approximately 1,000,000 gal. of oil a year are used in the manufacture of du Pont paints. The plans under consideration call for a factory large enough to supply this need and to produce a surplus to be sold to other paint concerns and to the oilcloth and linoleum trades, which also use the oil.

The site for the proposed new plant is along the Schuylkill River and is ideal for the purpose. It is on tidewater, which will enable ocean-going vessels to bring the flaxseed, from which the oil is recovered, direct to the plant from foreign countries, principally the Argentine, which is one of the chief sources of supply, as it is the largest producing country.

The manufacture of linseed oil has been under consideration by the du Pont Co. for a long time. Several new processes for its manufacture have been the subjects of investigation and experiment, and it is expected that one of these new processes will be adopted in the proposed plant.

California Glass Industry to Use Nearby Sands

The Technical Glass Co., of Los Angeles, is producing 45,000 flint-glass doorknobs daily, in hundreds of different sizes and patterns. This fact was brought to light recently by the purchase of a tract of land on East 48th St. and the announcement that the Austin Company of California has begun the erection of a new factory plant of modern steel, brick, terra cotta and glass construction.

Of importance to local industry is the fact that it is proposed to dispense in the near future with the use of silica sand imported from Belgium. Experiments with local sands have resulted in the discovery of a deposit containing material which is superior to the best foreign sand imported for glass making. Another important consideration is that export has been established to Canada, Hawaiian Islands and Australia.

The growth of this business has resulted from improvements in manufacture, whereby the company has been able to capture a large share of the national and the foreign market. The new factory, which will double the capacity of the present plant, will be equipped with a new type of continuous melting furnace and an electrically heated annealing furnace.

Foundation and Government Present Final Arguments to Court

Unusual Case Draws to Close at Wilmington, Del., With Last Skirmishes Between Anderson for Government and Kresel for Foundation

ON Oct. 8, the final argument in the trial of the government's suit against the Chemical Foundation opened in Wilmington, Del. The government opened by presenting an elaboration of the final brief of its case. Henry W. Anderson, special assistant Attorney-General, emphasized particularly the government's objection to the fact that officers of the government served both as sellers and purchasers in the transaction the government has tried to cancel.

Colonel Anderson asserted that the trading with the enemy act, under which the patents were seized, gave powers to the Alien Property Custodian, "under supervision and direction of the President."

Leading up to the allegation that the Chemical Foundation was organized as the consequence of a conspiracy of members of the dye industry, Colonel Anderson quoted from a memorandum of Jan. 13, 1919, by Custodian A. Mitchell Palmer, that "the power of seizure shall not be exercised wholesale" and that seizure should be made "only for the most cogent reasons."

Colonel Anderson said that the dye industry was dissatisfied with the arrangement then existing of licenses issued by the Federal Trade Commission and that it desired to substitute control of the licenses. He discussed evidence of the trial showing that a number of conferences were held between the Custodian's office and representatives of the American Dyes Institute, as a result of which Palmer decided to sell to the Chemical Foundation 6,475 patents, trademarks and copyrights for $250,000. Colonel Anderson said that some of the patents were yielding at the time as much as $100,000 a year each.

Case of Defence

When the defence opened its case on Tuesday, Isidor J. Kresel, leading attorney for the Foundation, interpreted the government allegations as constituting a charge that former President Wilson, Frank L. Polk, former Under Secretary of State; A. Mitchell Palmer and Francis P. Garvan, former Alien Property Custodians, and other prominent men were guilty of violating the statutes of the federal Criminal Code.

"I wonder," Mr. Kresel went on to say, "what President Harding, if he were alive today, would say if it were told to him that, as a result of his letter instructing Custodian Miller to demand the return of the patents, his representatives stood up in an American court and claimed that this transaction amounted to a violation of the criminal statutes and to a fraud on the government, practiced by President Wilson, acting Secretary Polk, Palmer, Garvan, Joseph H. Choate, Jr., Ramsay Hoguet, Bradley Palmer, Otto T. Bannard, Cleveland H. Dodge, George L. Ingraham, Benjamin Griswold, Jr., Ralph Stone and others?"

Kresel Makes Counter

Mr. Kresel called attention to the fact that the government had quoted Section 41 of the Criminal Code, providing a $2,000 fine or 2 years in prison for any person, corporation or association obtaining pecuniary profits from a business organization while acting as an agent of the United States in transactions with that organization. He argued that inasmuch as President Wilson, Mr. Polk and Mr. Palmer were aware of the transfer of the patents to the Foundation, they were liable, under the defence's interpretations of the government's charges, under the Criminal Code.

Colonel Anderson maintained the property should have been sold under conditions assuring the best practical results, and insisted that the private sale prevented them. He quoted the testimony of Mr. Palmer and Mr. Garvan that the $250,000 sale price was arrived at arbitrarily, and the testimony of Mr. Choate, counsel for the Custodian, that it was the result of guesswork. Colonel Anderson produced statistics to show that one batch of patents sold at an average of $21.65, despite the revenue of $50,000 annually yielded under one of them.

In leading up to his closing arguments for the defence, Mr. Kresel said: "We cannot rival counsel for the plaintiff in eloquence or imagination. We are not disturbed by the assertion that this nation is headed toward destruction. We were instrumental in having inserted in the peace treaty a stipulation that Germany would reimburse her nationals for any property seized by us or the Allies. There is no question here of national immorality unless it be the attempt of the government in seeking to set aside the exercise of discretionary war powers given to President Wilson by Congress. To do that would certainly amount to national immorality."

The final decision is not available at time of going to press and may not be rendered for some time due to the large amount of evidence awaiting the attention of Judge Morris.

To Popularize Chemistry

With the idea of stimulating popular interest in chemistry, the Business and Professional Woman's Section of the Washington, D. C., City Club, entertained more than 100 guests at dinner, Oct. 10. Dr. Charles L. Parsons, the secretary of the American Chemical Society, was guest of honor. Dr. H. E. Howe spoke on "The Romance of Chemistry." Dr. W. W. Skinner, of the Bureau of Chemistry, discussed "Chemistry in Food." Frank B. Gorin, the chief of the heavy chemicals section of the Chemical Division of the Department of Commerce, chose as his subject "Chemistry in Business." Miss A. Hazel Swift, of the Commerce Department's Chemical Division, presided.

Planning Beet Sugar Industry on Long Island

Meetings of Long Island farmers interested in growing sugar beets are being held this month in order to determine the amount of acreage that can be lined up for the Great Eastern Sugar Co. The first of these meetings was held at Riverhead, Oct. 2, and was directed particularly toward interesting the Polish-American farmers who are numerous in that locality. Another meeting was held at Farmingdale, Oct. 6, under the auspices of the New York State School of Agriculture.

A great deal of interest has been stirred up by the announcement that definite plans for the establishment of a sugar factory on Long Island have been adopted and many farmers have indicated their desire to engage in beet growing. It is said that the factory will be established wherever the best supply of beets can be obtained on 3-year contracts.

Connecticut Valley Chemists Become Active

The Connecticut Valley branch of the American Chemical Society had its first meeting of the season Oct. 6 at the Tekoa Country Club, in Westfield, Mass. Following a discussion of fall and winter activities, dinner was served and Dr. Denis Calhune of the department of industrial chemistry at Worcester Polytechnic Institute spoke on "Recent Developments in Electrochemistry." Prof. L. B. Allyn and Robert K. Prince had charge of the meeting.

These officers were nominated to be voted on at the November meeting in Hartford, Conn.: Chairman, Dr. G. Albert Hill, Wesleyan University; vice-chairman, J. C. Hogaboom, New Britain, Conn.; secretary-treasurer, George Lovering, Hartford; councilor, Dr. George Chamberlain, Amherst, Mass.

Limonite Deposits in Wales

Competition for American limonite may result from the discovery of deposits of this mineral at Penderyn, in Wales. Information reaching Washington from Great Britain is to the effect that the deposits are important. Limonite is used extensively in the British Isles in the manufacture of paint, linoleum and for glazing purposes. These requirements now are being met by American producers.

Washington News

Auction Sale of Nitrate Lands in Chile

A report from Assistant Trade Commissioner W. E. Embry at Santiago says that the Chilean Government, in order to finance the 1923 budget, which calls for expenditures during the present year amounting to 385,240,880 paper and 85,486,431.67 gold pesos (1 peso = $0.365 at normal and $0.1254 at current rate of exchange), has proposed the sale of certain government nitrate lands. The project is that presented to the Chilean Senate by the finance committee at the direction of Mr. Subercasseaux, present Minister of Finance, for the sale at public auction of certain important nitrate properties in the Provinces of Antofagasta and Tarapaca. It was first referred to the Senate on July 28, since which date it has been given preference over all other pending matters owing to its urgency as a revenue measure. The sale of these lands will bring in approximately 30,000,000 pesos and the Minister of Finance has been doing everything possible to impress upon that legislative body the urgent and imperative necessity of having the project become a law immediately.

Manufacture of Chemical Products from Agricultural Wastes

Greater utilization of agricultural wastes and surpluses will be one of the main objectives which Dr. Charles Albert Browne, the new chief of the Agricultural Department's Bureau of Chemistry, will seek to attain. He points out that the problems are fundamentally chemical ones. In an industry operating on as close margins as does agriculture, a particularly profitable service can be performed by devising ways of turning what has been a loss into a substantial profit. The manufacture of industrial alcohol, the production of citric acid and citric beverages, and the production of sweet-potato sirups are examples of the things which Dr. Browne has in mind.

Dr. Browne cited in this connection the very great increase in the amount of industrial alcohol being made in tropical countries. In those countries where the price of gasoline is relatively high, the alcohol which has been developed has become the motor fuel that is used almost exclusively. He is informed that under certain favorable conditions alcohol is being manufactured at a cost of 5 cents a gallon.

Since a very large tonnage of unmarketable citrus fruit and culls are wasted each year, Dr. Browne feels that a particularly promising field is open there. He believes citrus beverages can be developed and other uses found for the unmarketable portion of the crop, which will add materially to the profits of its production. Promising results already have been obtained in the manufacture of sweet-potato sirup. In addition to the pure sirup, various blends with maple and cane sirup are possible.

The conversion of sugar cane by gas and other fibrous byproducts into building boards of various kinds is another example cited by Dr. Browne of the possibilities of intensive study on the possible uses of agricultural wastes.

Dr. Browne expects to visit the branch laboratories of the bureau in the near future. He will time his trip so as to visit the New Orleans laboratory during the sugar season. He will return to Washington to be present at the opening session of the Association of Official Agricultural Chemists on Nov. 19.

August Production of Acetate of Lime and Methanol

According to reports received from manufacturers by the Department of Commerce, production of acetate of lime in August was slightly under the output of July. A gain, however, was shown in production of methanol as compared with the July total. Production figures for the first 8 months of the year are as follows:

	Acetate of Lime, Lb.	Methanol, Gal.
January	15,434,065	863,608
February	13,154,735	724,037
March	14,732,054	786,774
April	13,237,584	710,987
May	14,667,584	796,481
June	14,129,529	727,458
July	12,873,572	645,673
August	12,815,237	649,063

President Coolidge May Call for Oil Pollution Conference

President Coolidge is taking up with the State Department, it is understood, the matter of calling an international conference to discuss oil pollution. It was stated at the White House that the President attaches much importance to this matter. It is expected that he will request active consideration of the entire subject in the hope that remedies may be attempted at the earliest possible moment.

Mineral Turpentine Given Preference in Shanghai

Mineral turpentine, which sells for about half the price that is asked for vegetable turpentine, is the variety most widely used in the paint trade in Shanghai. This is due to the fact that the average per capita purchasing power is very small and price is of paramount importance. Retail prices for vegetable turpentine are from 4 to 4.5 Mexican dollars (1 Mexican dollar = $0.4811 at normal and $0.5109 at current rate of exchange) per gallon. Mineral turpentine retails at 2.25 and imitation turpentine at 1.5 dollars per gallon. Russian turpentine is sold in this market at prices that are 20 per cent lower than American quotations.

Small Output of Arsenic in Greece

The only arsenic produced in Greece is a byproduct of silver-lead treatment, the so-called white arsenic or arsenious acid, says a report received by the Department of Commerce from John G. Erhardt, consul in charge at Athens. The present production is about 60 tons a month. Greece has no producing mines or arsenic ores. There have been reports that deposits have been found in the Province of Thessaly, north of Greece, but up to the present no mining has ever been attempted. There is only one smelting company, which has its head office in Paris. Sales are made to England and France at £64 per long ton, f.o.b. Laurium. Production at the present time is greatly reduced because of a labor shortage, but with the approaching demobilization of the Greek army it is expected that labor will be more plentiful.

Antwerp Center of Congo Gum Copal Trade

Consul G. S. Messersmith at Antwerp reports that practically the entire trade in Congo gum copal passes through the port of Antwerp, Belgium. Figures from what may be considered a reliable source contain estimates that last year 12,816 metric tons of gum copal was shipped from the ports of Matadi and Bona, in the Belgian Congo, to Antwerp. Shipments of this gum to ports other than Antwerp are estimated at from 2,000 to 3,000 tons. The annual exports of gum copal from the Belgian Congo average 18,000 to 20,000 tons.

Declared export returns of the American Consulate at Antwerp reveal the fact that 7,527 short tons of gum copal was shipped to the United States during the year 1922, with a declared value of $483,075.

Lift Ban on Imports of Dyestuffs Into Irish Free State

The dyestuffs (import regulation) act of 1920, which was passed by the Parliament of the United Kingdom on Dec. 23, 1920, and provisionally adopted by the Irish Free State when that government was established, has been repealed in so far as it applied to the Free State by an act passed by the Dial Eireann on Aug. 8, 1923. The original act provided that with a view to the safeguarding of the dye-making industry, the importation into the United Kingdom of synthetic organic dyestuffs, colors and coloring matter, and all intermediate products used in the manufacture of any such dyestuffs, colors or coloring matter, shall be prohibited.

As a result of the repeal of the act the dyestuffs market of the Irish Free State is now open to American producers on equal terms with all others.

News Notes

Plans have been perfected whereby meetings will be held at the Bureau of Standards, at the Bureau of Chemistry and at the Interior Department in connection with the program of the American Institute of Chemical Engineers, which will meet in Washington Dec. 5, 6 and 7.

The metallurgical industries of the United States, exclusive of iron blast furnaces, employed 44,000 men during 1922, an increase of nearly 18 per cent over 1921, according to statistics gathered by the Department of the Interior through the Bureau of Mines. The volume of work at mills in 1922 showed an increase of 37 per cent over the previous year; the increase at smelters was 9 per cent; while an increase of 69 per cent was shown for construction work, shops and yards connected with the mills and smelters.

The New Jersey Zinc Co., Palmerton, N. J., has opened its evening technical school for the season, effective Oct. 2, and will hold sessions in the high school building. Additions have been made in the curriculum of last year, and a larger number of students at the plant have enrolled for the different courses.

A cement industry is to be established at Popcum, 10 miles from Chilliwack, B. C., by a recently organized company known as the Mainland Portland Cement Co. The company has secured the Hart and Damask property, which is rich in marl, and it is reported that work on the plant, representing an investment of about $1,000,000, will commence shortly.

The Belgo-Canadian Paper Co., Ltd., is setting new records under reorganized management and production is now reported to be at the annual rate of 90,000 tons. On March 1 last the company was working on a 65,000 tons a year basis so that an approximate 40 per cent increase in production is shown over 7 months.

Power Exposition Increases in Size This Year

About two hundred exhibitors have signed contracts for space at the Second Exposition of Power and Mechanical Engineering. The devices and apparatus to be exhibited cover the field of power and mechanical engineering from the handling of the coal at the power plant until power is turned into work. Not only will there be representatives of steam-generating devices and prime movers but also exhibits of those who have devoted their efforts to the solution of the troublesome problems involved in burning fuel and making and using power, whatever the industry using the heat and power derived. The generation of heat and the production of power are factors common to all industries, though they may vary in importance over a wide range. The factory the principal production of which is small metal parts will have a power cost that is a small percentage of the total, while at the other extreme is the manufacture of electricity. It is expected that there are many industries, such as the metallurgical, ceramic, textile, rubber and cement, the engineers of which will be interested in this exposition inasmuch as these industries are large users of fuel.

H. M. Howe—In Memoriam

At the Episcopal Cathedral of St. John the Divine, 110th St. and Amsterdam Ave., New York City, at 5 p.m. on Thursday, Oct. 25, 1923, will be held a memorial service for the late Dr. Henry Marion Howe, president of the A.I.M.E. in 1893, in whose memory the Institute has recently established the Henry Marion Howe Lecture. The memorial service will be largely musical, by the Cathedral organist and choir, with short addresses. Dr. Michael Pupin has been asked to be one of the speakers.

After conference between Bishop Manning and Judge Gary, as president of the American Iron and Steel Institute, the date of the service was selected so as to coincide with the autumn meeting of the A.I.S.I.

The Cathedral is more than large enough to seat all who come. Everyone is invited who is interested or attracted by the beauty of the service, or who desires to join in this token of respect to the distinguished and honored scientist.

French Chemical Industry Exhibits at Pasteur Centenary

The Pasteur Centenary Exposition at Strasbourg will cover a period of 10 weeks. Among the most important features of interest to Americans will undoubtedly be that of refrigeration and its application which is to be featured in mid-September.

French chemical industries in general have come out with more strength and publicity than at any time since before the war. Chemical and pharmaceutical products have a special building to themselves wherein the exhibits run from aspirin to shoe blacking and printing ink, artificial silk and pottery and glass for laboratory use. It may be considered as a direct challenge of the French chemical industry to the world and above all a defiance of the claims of Germany's like industry as being preeminent.

Some figures made public by the Union Syndicate des Fabricants des Matières Colorantes of Paris are interesting, the association grouping most of the big dyestuff fabricants in France. Production in recent years was as follows:

	Kilos		Kilos
1916	463,344	1920	6,517,401
1917	961,579	1921	5,288,061
1918	759,771	1922	7,481,347
1919	2,316,388		

Nitrogen Prices Based on Rye

The German Nitrate Syndicate, finding it impractical to keep pace with changing values of the mark, has fixed upon a ratio for the price of nitrogen compounds to the price of rye. In general the ratio is that 100 kg. of ammonium sulphate will be considered worth the value in paper marks on any day of 140 kg. of rye. This price is affected by certain allowances for fertilizer containing foreign raw materials; and, too, the price varies with other nitrogen compounds somewhat in proportion to their nitrogen content, but also in accordance with the following schedule which shows the relative prices per kilogram of nitrogen contained in the compounds:

	Per Cent N	Kg. of Rye
Ammonium sulphate.....	20.5	6.83
Sulphate, dried and ground	20.8	6.90
Ammonium chloride.....	25	6.83
Kalium ammonia nitrate....	16	6.83
Atmospherie nitrate (Leuna)	25–27	6.83
Sodium nitrate.....	16	7.59
Calcium nitrate.....	18–22	6.07
Dried blood.....	10	5.55
Horn meal.....	9	6.15

These ratio figures are an interesting indication of the German appraisal of the relative fertilizer value per unit of nitrogen contained.

The following tabulation shows an interesting résumé of the actual prices expressed in paper marks at the indicated rates of exchange on three dates during July, as reported to the Department of Commerce by a consular communication:

MARK PER KG. NITROGEN IN 100 KG.

	July 10 (Marks)	July 17 (Marks)	July 27 (Marks)
Exchange $1.....	176,000	218,000	760,000
Sulphate of ammonia..	52,400	84,300	128,000
Chloride of ammonia..	52,400	84,300	128,000
Ammonium potassium nitrate.....	52,400	84,300	128,000
Nitrate of soda.....	62,900	84,300	154,200
Calcium cyanamide...	46,800	75,200	114,100

Spanish Salt Mines Will Be Leased

A royal decree of the Ministerio de Hacienda, dated July 17, 1923, convoked a second public adjudication for the renting of the salt mines of Torrevieja and La Mata in the Province of Alicante.

The conditions subject to which the lease will be granted are set forth in great detail. The lease will be for 20 years, renewable for an additional 5 years in case the administration has been completely satisfactory to the government. A fixed rent of 1,000,000 pesetas annually is to be paid and, in addition, 0.15 peseta per quintal of salt sold, which rate is subject to increase with the market price of salt. The lessee is under the obligation to produce and sell 273,000 tons of salt annually, or 1,365,000 tons for each period of 5 years. The lessee can construct chemical works for the utilization of salt as a raw material, all buildings, etc., to be the property of the state at the end of the lease. The lessee will have the right to fix prices for export, but for home consumption these cannot exceed a figure fixed by a commission.

Society of Steel Treaters Hold Successful Convention

Pittsburgh Meeting Well Attended—Exhibits of Equipment Growing—Technical Sessions Arouse Keen Interest

The fifth annual convention of the American Society for Steel Treating, held during the past week at Pittsburgh, proved to be a very successful meeting, in the opinion of many of the members present, both from the standpoint of the exhibits and of the technical sessions. The exhibition of equipment was fully a third larger than that which was shown at Detroit last year. Because many of the exhibitors had apparatus in actual operation, the show had a very live appearance. Certain definite progress made in the metal arts during the year was in evidence, as in the case of new machines for testing properties of metals and (of special interest to chemical engineers) three chronium-iron refractory alloy deep drawn pots which were shown by the Cutler Steel Co. These pots were made last week. Since it has been considered impossible to do this in the past, the achievement was considered noteworthy by many of those present.

At the technical sessions, papers were presented by authorities from this country, England, France and Japan. These sessions were well attended and the discussions following were lively, producing much valuable information. In next week's *Chem. & Met.* a complete report of these sessions will be made.

Social activities included a smoker on Tuesday evening, a dance on Wednesday evening and the annual banquet on Thursday evening. Each of these events proved to be very enjoyable. At the annual meeting on Wednesday morning, the election of the following new officers was announced: President, G. K. Burgess; first vice-president, E. W. S. Biddle; second vice-president, R. N. Burt; treasurer, Zay Jeffries; new member board of directors, J. F. Hartford.

The reports of the secretary and treasurer showed the society to be in a healthy condition and growing very rapidly. It was stated that the society handbook of looseleaf data sheets will be passed by the society standards committee and released in about 2 months. This is the composite work of all of the members of the society and besides including data on heat-treating directly, will also include information on such subjects as pyrometry and heat transfer.

Arsenic Co. Forming in Alabama

The formation of a company to work the arsenic-producing ores of Alabama found in Randolph and Clay counties is under way. The company will be known as the American Arsenic Co. Under the plans of the concern a plant will be erected at Cragford. At this point it is said that the ore properties owned by this concern extend from the railroad in both directions.

Royal Commission Finds Witnesses Largely Opposed to Pulpwood Embargo

Opening of Hearing Which Will Determine Course to Be Taken Indicates Much Sentiment for Passing Up Proposed Restriction

ALL the witnesses that appeared before the opening session of the Royal Commission on Pulpwood in Halifax, N. S., declared themselves as being entirely and unalterably opposed to anything in the nature of an embargo on the export of pulpwood to the United States or elsewhere. Five witnesses representing both the exporters and the small farmers who sell for export appeared before the commission; and so unvarying was the opposition expressed that Chairman Picard finally exclaimed: "We should now like to hear from the gentlemen who are in favor of the embargo, if there are any." None were forthcoming, however, and the further witnesses called simply reiterated in one form or another the objections voiced by those who had preceded them.

The witnesses represented all parts of the province where there is a pulpwood industry. Phases of it referred to were the large and small operators; the buyers and shippers for export; the small farmers, both those owning pulpwood properties of their own and those depending on the income received from large operators; practical surveyors and "cruisers" who have an intimate knowledge of forest conditions, and various other classes.

Probably one of the most interesting and informative witnesses, whose evidence pretty well sums up that given by the other witnesses, was Ralph Bell, who manages and supervises the holdings of two important companies, the Nova Scotia Timber Lands Co., Ltd., and the Cedar Lake Lumber Co., the former being one of the largest property owners in the province. Mr. Bell also deals personally in timber lands and pulpwood. He said that the shutting off of one of the most important markets by an embargo would not make for conservation; it would merely change the form in which forest products leave the country.

"Theorists are always coming forward with prescriptions guaranteed to cure the ills of a country," he said, "and within the past few years one has appeared on the Canadian horizon who tells us that the thing we need is an embargo on the exportation of pulpwood. In one breath he tells us it is needed to conserve what he describes as our rapidly vanishing timber supplies, and in the next prophesies that within 6 months from the establishment of an embargo scores of new mills will be erected in the country. If the second is true, the first falls to the ground; so taking him at his own word, an embargo is not a measure of conservation."

New York Chapter, A.C.S., Opens Season at Chemists' Club

The first of the usual series of winter meetings of the New York Section of the A.C.S. was held at the Chemists' Club on Friday, Oct. 5. Following dinner, nominations of officers for the coming season were made as follows: Committee making nominations, C. F. Roth, A. E. Hill and D. H. Killefer; chairman, C. E. Davis; vice-chairman, P. A. Levene; secretary-treasurer, D. H. Killefer; executive committee, H. R. Moody, R. F. Bacon, R. R. Renshaw and H. B. Faber; councilors, B. T. Brooks, F. R. Eldred, T. B. Freas, Ellwood Hendrick, A. E. Hill, M. H. Ittner, James Kendall, D. B. Keyes, H. B. Lowe, K. G. Mackenzie, H. R. Moody, R. P. Rose, Hugh Taylor, A. W. Thomas, C. P. Titus, David Wesson, Lois Woodford, chairman of section and secretary of section; ultimate councilor, C. O. Johns.

Following these nominations the evening was devoted largely to sugar and food problems, four talks being given, including one by Dr. Stroud Jordan, chief chemist, Henry Heide Co. of New York, on "The Manufacture and Uses of Invert Sugar"; one by Dr. D. L. Davoll, supervising chemist, Arbuckle Bros., on "Some Salient Points in Sugar Manufacture and Economics"; one by Dr. F. C. Weber, Fleischmann Laboratory, "Bread and Its Relation to Diet," and one by Prof. Henry C. Sherman, Columbia University, "Vitamines as Factors in Food Values."

Czechoslovakia Chemical Industries Growing

The chemical industry is one of the youngest industries in Czechoslovakia. Until recently Germany supplied almost exclusively the country's requirements in chemical products, but the Czechoslovak production for some time past has tended to develop more and more.

According to the *Gazette de Prague*, the union of producers of alizarine dyes of which the headquarters are at Usti (Aussig), has put on the market several new dyes, notably sulphur products, which have met with appreciation.

It is believed that efforts are being made at present with the view of producing synthetic indigo in Czechoslovakia, in the manufacture of which the Ostrava coal tar would form a valuable element. This production would be of great importance.

It is also reported that the factory which is carrying out these investigations is also contemplating the extraction of nitrogen from the air on a large scale.

Fire Prevention Exposition Held During Past Week

Agencies of Country Combine to Fight Fire Menace, Which Is Exacting a Heavy Toll in Life and Property

An exposition, unique among most affairs of this kind, has been held during the past week in New York City for the purpose of bringing together equipment, materials and agencies designed to promote fire prevention. Men of prominence in civic and industrial affairs of the United States and Canada joined in this first fire prevention congress and exposition.

Speakers sounded the warning of a growing fire menace despite the precautions of modern science, and indicated what steps must be pursued to lessen the enormous annual losses to property and life.

Dominion Fire Commissioner Smith of Ottawa characterized the national fire losses as a "shameful waste," attributable to the carelessness of individuals, and declared it the individual duty of every good citizen to end this carelessness, which, in the United States and Canada, levies a non-compensating tax of $1,250,000,000 each year upon the people. It is as much a tax as if it were levied for revenue, he declared.

Many speakers of prominence were included on the programs. In addition messages were read from President Coolidge, Samuel Gompers and William S. Fielding.

The exhibits, while not numerous, were complete and covered every phase of fire prevention work from automatic alarm systems to non-burning paper. Wire glass, metal lath, non-burning roofing materials and the like were also shown. Various manufacturers of chemical extinguishers were present, as were the automatic sprinkler makers.

The educational exhibits included one made jointly by the U. S. Forest Service and the National Lumber Manufacturers' Association, one by the National Fire Protection Association and one by the Underwriters' Laboratories, Inc. The last was especially complete, demonstrating the application of science to fire detecting, preventing or proofing devices.

Installed in a specially constructed theater in the exposition, a succession of fire prevention and fire protection films was shown by the Motion Picture Producers and Distributors of America in order to convey knowledge on this subject more vividly than is possible through the printed or spoken word.

Organize New Carbon Black Company

The Columbian Carbon Co. and the Texas Co. have jointly organized a new company, known as the Coltexo Corporation, to engage in the production of carbon black and natural gas gasoline through the development of the natural gas properties owned by the Texas Co. These properties are situated in the Monroe gas field of Louisiana and the Parks field of Texas.

German Glass Industry in Bad Condition

The Prussian Chamber of Commerce's report on the German glass industry during the past month says that in the table glass section there were complaints regarding deliveries of sulphate. Employment declined during the month. At some mills cancellations of orders were received. The lack of working capital leads to fears that a part of the works will have to close down. The rise in prices makes any increase in inland orders impossible. Sales abroad ceased almost entirely, as the Czechoslovak and Belgian industries were able to quote substantially lower prices than the German manufacturers.

From the hollow glass industry complaints of insufficient supplies of soda and red lead were received. The prices of raw materials rose in an extraordinary manner and the mill prices had therefore to be considerably increased. Partial strikes hindered production. As a result of the lack of orders and the scarcity of working capital cessations of activity took place or were contemplated.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	64⅛	62⅛
Allied Chem. & Dye	64⅝	62⅛
Allied Chem. & Dye pfd.	106⅛	106
Am. Ag. Chem.	13⅛	12⅛
Am. Ag. Chem. pfd.	35⅛	30⅛
American Cotton Oil	6⅛	6
American Cotton Oil pfd.	19	19⅛
American Cyanamid	*75	75
Am. Drug. Synd.	6	5⅝
Am. Linseed Co.	17	17⅛
Am. Linseed pfd.	*38	36
Am. Smelting & Refining Co.	58⅛	58
Am. Smelting & Refining pfd.	96⅛	97
Archer-Daniels Mid. Co. w.i.	27	26⅛
Archer-Daniels Mid. Co. pfd.	90	89
Atlas Powder	53⅛	52⅛
Casein Co. of Am.	*63	*63
Certain-Teed Products	*27	*30
Commercial Solvents "A"	27	30
Corn Products	127⅛	119
Corn Products pfd.	120	123⅛
Davison Chem.	47⅜	45⅛
Dow Chem. Co.	*47	*47
Du Pont de Nemours	129	124⅜
Du Pont de Nemours db.	86⅛	86
Freeport-Texas Sulphur	12⅜	12⅛
Glidden Co.	7	*7⅛
Grasselli Chem.	*132	*132
Grasselli Chem. pfd.	*105	*105
Hercules Powder	107	107
Hercules Powder pfd.	105	105
Heyden Chem.	*1¼	1⅛
Int'l Ag. Chem. Co.	*2	1⅞
Int'l Ag. Chem. pfd.	7	*7⅛
Int'l Nickel	12⅛	11⅛
Int'l Nickel pfd.	78	77
Int'l Salt	*89⅛	*89⅛
Mathieson Alkali	37⅛	37⅛
Merck & Co.	*80	*79
National Lead	119	117⅛
National Lead pfd.	112⅛	112⅛
New Jersey Zinc	147	147
Parke, Davis & Co.	76½	79
Pennsylvania Salt	85	89⅞
Procter & Gamble	*132	*132
Sherwin-William.s	30⅛	30⅛
Sherwin-Williams pfd.	*100⅛	*100
Tenn. Copper & Chem.	9⅛	9
Texas Gulf Sulphur	58⅛	57⅜
Union Carbide	54⅛	53
United Drug	77	75
United Dyewood	42⅛	42⅛
U. S. Industrial Alcohol	54⅛	50⅛
U. S. Industrial Alcohol pfd.	*100	*100
Va.-Car. Chem. Co.	9⅜	9⅛
Va.-Car. Chem. pfd.	27⅛	26⅛

*Nominal. Other quotations based on last sale.

Financial Notes

The Continental Can Co. has declared a regular quarterly dividend of $1 on the common stock, payable Nov. 15. The directors approved the purchase of the National Can Co.

The statement of the American Smelting & Refining Co. and its subsidiaries for the first 6 months of the year shows a net income of $5,096,045. This is an increase of $3,270,122 over the corresponding period last year.

The directors of the Naumkeag Steam Cotton Co. have recommended to the stockholders that a stock dividend of 100 per cent be declared, which would increase the capital stock from $3,000,000 to $6,000,000. To take action on this recommendation, a special meeting of the stockholders has been called for Oct. 17.

Although no time limit has been set for the final deposit of American Cotton Oil common and preferred stock for the new Gold Dust common, the stockholders' committee is encouraged by amount of stock already deposited and indications are that plan of reorganization will become operative shortly.

Plate Glass Production Running High

Production of plate glass in the United States this year will approximate 90,000,000 sq.ft., almost double that of 2 or 3 years ago, according to a statement issued by P. A. Hughes, secretary of the Plate Glass Manufacturers of America. In the first 6 months of 1923 production amounted to 43,962,855 sq.ft., and it is pointed out that if the estimated total of 90,000,000 sq.ft. is reached by the end of the year, it will mean that almost 1 sq.ft. of plate glass will have been manufactured in 1923 for each man, woman and child in the country.

In 1921, the total was 53,578,672 sq.ft. For the first half of 1922 it totaled 36,781,805 sq.ft. During the last half of 1922, 39, 896,402 sq.ft. was manufactured, making a total of 76,678,207 sq.ft. for that year.

Lehigh Chemists Hear Talk on Patents by Newton Perrins

The Lehigh Valley Section of the American Chemical Society held its regular monthly meeting, Sept. 28, at Bethlehem, Pa., the session being conducted in the chemical laboratory at Lehigh University, following a dinner at the Hotel Bethlehem. Eugene C. Bingham, Lafayette College, Easton, Pa., chairman of the section, presided. The principal address of the evening was made by Newton Perrins, Rochester, N. Y., patent expert, connected with the Eastman Kodak Co., who spoke on "Patents—Curious, Foolish and Ridiculous." The next meeting will be held at Easton on Oct. 26.

Market Conditions

Chemical Products Moving to Consumers in Steady Volume

Active Trading Delayed by Less Than Capacity Operation of Large Manufacturing Trades—Prices Show Some Irregularities

THE improved tone to trading which set in, in the chemical market last month is still in evidence and fair business is reported for a majority of selections for spot and nearby deliveries. Contract business also has been prominent and according to some reports a large part of consuming needs in basic chemicals has been covered ahead.

Buying has been prevented from reaching the active stage by the fact that production in many lines had been larger earlier in the year than consumption warranted. This left manufacturers in a position where they carried large surpluses through the summer and they have not yet been reduced to the point where an active call for fresh supplies of raw materials might be expected. The recent disaster in Japan also has disturbed trade inasmuch as silk mills are reported to be feeling the lack of stocks and are working, or planning to work, at reduced capacity. This in turn holds back buying of chemicals, oils and kindred products in that trade.

The weighted index number fell off slightly during the week and in general it is stated by traders that prices have eased off due partly to declines in materials which were more active in the summer period and eagerness on the part of sellers to book orders for fall and winter deliveries. It is further stated that many contracts were closed because of price concessions, with buyers taking the view that current values were relatively low and would not hold after producers had booked a fair amount of business.

Import statistics indicate that foreign chemicals continue to reach domestic markets in a large way and competition from abroad promises to be a factor in the future markets. Advices from Germany are still indefinite and a clear idea cannot be formed regarding probable production in the Ruhr section.

The market for arsenic is described as quiet but is being followed closely. Domestic producers were offering contracts to consumers during the past week on more favorable terms but spot goods and shipments from foreign producing centers are firmly held with sellers apparently not anxious to force matters.

Agricultural chemicals have come in for more attention and reports from Chile have stated that fertilizer interests in this country and in Europe have been buying freely. Sulphate of ammonia is firm in foreign markets with local sellers uncertain about the probability of the export situation.

Bicromate of Soda Easy — Imported Tartaric Acid Lower—Mineral Acids Irrregular — Nitrite of Soda Production Curtailed—Permanganate of Potash Lower on Shipment — Domestic Producers Lower on Arsenic Contracts — Bleaching Powder Still Unsettled.

Acids

Acetic Acid—The sharp decline in export trade in August is revealed by the fact that outward shipments that month were 49,545 lb. valued at $6,752 as compared with 938,123 lb. valued at $58,558 in August, 1922. For the 8 months ended August exports were 621,595 lb. as against 4,103,668 lb. in the corresponding period last year. Import figures on acetic acid are not available but it is stated that considerable quantities are brought into this country with the higher grades predominating. Present trading is featured by an easy price tone but quotations are unchanged at: $3.38@$3.63 per 100 lb. for 28 per cent; $6.78@$7.13 per 100 lb. for 56 per cent; $9.58@$9.83 per 100 lb. for 80 per cent; $12@$12.78 per 100 lb. for glacial.

Citric Acid—Imports in August were officially placed at 67,200 lb. valued at $17,719. For the 8 months ended Aug. 31 imports were 692,047 lb. valued at $213,477. Import statistics were not given separately prior to October, 1922, so no comparisons can be made with imports of last year. The local market is quiet and only small lots were reported to be moving. Prices are given at 49@50c. per lb. for both domestic and imported grades.

Oxalic Acid—Slow demand and keen competition between foreign and domestic makes have kept the market in an easy position as far as prices are concerned. Domestic acid is offered at 11¾c. per lb. at works, and imported is generally quoted at 12c. per lb. on spot. Imports in August were 160,402 lb. valued at $11,925, which compares with 11,200 lb. valued at $1,084 in August, 1922. Imports for the 8 months ended Aug. 31 were 1,914,391 lb. valued at $150,209.

Sulphuric Acid—Official figures show exports in August at 1,619,840 lb. valued at $25,614 as against 672,533 lb. valued at $16,120 in August last year. Exports for the 8 months ending August were 6,185,572 lb. in 1923 and 10,685,256 lb. in 1922. Imports of sulphuric acid in August were 450,500 lb. valued at $3,865 and imports for the first 8 months of the year were 18,840,053 lb. valued at $158,571. A freer movement of this acid is reported but stocks are large and prices are easy with some shading of quotations possible. Asking prices are $9@$10 per ton, in tanks, at works, for 60 deg. and $15@$16 per ton for 66 deg. acid.

Tartaric Acid—The market has been featured by a weakness in price resulting largely from quiet consuming demand and pressure on the part of holders of stocks. Imported acid on spot was offered at 30½@31c. per lb. although this was under the cost of shipments. Domestic acid was easy at the recently reduced level of 34½c. per lb. Imports in August were 119,696 lb. valued at $33,504. For the first 8 months of the year imports were 1,323,340 lb. valued at $330,309.

Potashes

Bichromate of Potash—Exports of bichromate in August were 146,863 lb., valued at $14,526, as compared with 334,535 lb. valued at $29,607 in August last year. For the first 8 months of the year exports were 2,419,808 lb. valued at $218,097 and 3,807,385 lb. valued at $374,554 last year. Export demand at present is slow and the same is true of buying for domestic account. Prices are easy with 9½c. per lb. as the prevailing quotation for round lots.

Caustic Potash—Foreign and domestic grades are now competing on a fairly even price level. The domestic product is offered at 7c. per lb. at works with the usual premiums for small lots. Imported caustic is easy in tone with both spot and shipment offered at 7c. per lb. Imports of caustic were 760,149 lb. valued at $58,604 in August and 6,721,652 lb. valued at $442,613 for the 8 months ended Aug. 31.

Permanganate of Potash — The spot market is holding up well in price with 18c. per lb. asked by most holders.

Shipments from abroad have eased off and could be bought during the week at 17¼c. per lb. Domestic makers continue to offer at 17@17½c. per lb. at works which made the latter more attractive at some delivered points.

Potash, Titanium Oxalate—Under a wider call from consumers the market has increased in activity and prices have taken on a firmer appearance. Quotations are given as steady at 28@30c. per lb. at works.

Sodas

Soda Ash—In spite of the fact that some consuming trades are reported to be working at less than capacity, there is a good movement of ash into consumption. Demand for jobbing lots has gained in volume in recent weeks and contract withdrawals are regular and involve large amounts. While all producers have not openly announced contract prices they are pretty generally established for light ash at $1.33 per 100 lb. in bulk, $1.45 per 100 lb. in bags, and $1.69 per 100 lb. in bbl. Dense ash on contract is held at $1.42 per 100 lb. in bulk, $1.51 per 100 lb. in bags, and $1.75 per 100 lb. in bbl.

Bichromate of Soda — An uncertain feeling has existed concerning prices due to reports that prominent factors were trying to place contracts with consumers and were cutting prices in order to book such business. Consumers in the textile and leather trades are reported to have been slow about placing orders this season and this led to competitive selling on the part of producers. The lowest prices at which contracts are reported to have been taken are not quoted in the open market. These prices range from 7c. to 7¼c. per lb. with spot and nearby quoted around 7¼c. to 7¾c. per lb.

Caustic Soda — From official figures it is shown that exports for the 8 months ended Aug. 31 were 79,596,084 lb. valued at $2,735,059 as compared with 107,934,526 lb. valued at $3,963,763 for the corresponding period last year. Moderate export buying is reported in the current market with standard brands holding around 3.10c. per lb. f.a.s. Outside brands are reported to have sold freely a short time ago and some producers are not offering for prompt shipment. For domestic consumption caustic is offered at $3.16 per 100 lb. in car lots at works.

Nitrate of Soda—Imports in August were 56,637 tons valued at $2,797,362 as against 42,474 tons valued at $1,772,195 in August, 1922. Imports for the 8 months ended August were 662,443 tons as compared with 271,326 tons in the corresponding period of 1922. Reports from producing centers have indicated a better demand for nitrate. Recent buying in a large way by this country is reported and Europe also is credited with placing good sized orders. Deliveries to Europe in the first half of September were 16,500 tons. Prices are reported to be holding on a steady basis with spot material quoted at $2.45 per 100 lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = for 1913-14

This week	165.17
Last week	165.27
Oct., 1922	152.00
Oct., 1921	151.00
Oct., 1920	263.00
Oct., 1919	233.60
Oct., 1918	280.00

No important changes occurred in the market for chemicals and allied products. The index number at the close was off 10 points.

Nitrite of Soda—Final arguments on the tariff hearing on nitrite were presented on Oct. 6, but developed nothing new and the trade is now awaiting a decision. The market at present is featured by a scarcity of domestic nitrite. This is noted more in the case of later deliveries than for spot material and is accounted for by the fact that producers are reported to have stopped operations and offerings are restricted to stocks on hand either in the hands of producers or of second hands. Imported nitrite also is holding a more regular price position and is quoted at 7¾@8c. per lb. Imports of nitrite in August amounted to 391,841 lb. valued at $17,924 and for the 8 months ended August imports were 4,173,549 lb. valued at $186,616.

Miscellaneous Chemicals

Acetate of Lime—Production for August is reported at 12,815,237 lb. This is slightly under the July total and is smaller than for any of the preceding months of this year, the highest point having been reached in January with an output of 15,434,065 lb. Exports for the first 8 months of the year were 18,620,691 lb. as compared with 21,417,580 lb. in the corresponding period of 1922. Current buying for export is said to be moderate, but there is a steady movement to domestic consumers and prices are well maintained at $4 per 100 lb.

Arsenic — Actual buying orders are small, but the market is still of interest especially for forward positions. Spot arsenic is steadily held at prices varying from 11¾c. to 12¼c. per lb. with most holders not quoting the inside figure. Future positions for foreign arsenic are strong with 12@12¼c. per lb. given as the market. Some domestic producers have quoted as low as 11c. per lb., with others still reserved and practically out of the market.

Sulphur—Good call is reported for deliveries against old orders and a steady movement continues into consuming trades. Prices are steady at $16@$18 per ton for domestic, f.o.b. Texas and Louisiana mines; $18@$20 for export, f.a.s. New York.

Copper Sulphate — No change was noted in the local market. Imported sulphate holds around 4¾c. per lb. on spot with buying restricted. Shipments are quoted at 4¼c. per lb., but this price was easy and in some quarters it was stated that business could be done at lower levels on firm bids. Domestic is held at 4.90@5c. per lb.

Alcohol

Demand for denatured was fair and a steady undertone prevailed in all quarters. Formula No. 1 closed at 41c. per gal., in drums, carload basis. On the special, 190 proof, producers held out for 40c. per gal., in drums. Ethyl spirits, U.S.P., 190 proof, held at $4.75 @$4.80 per gal., in bbl. In some directions the market for methanol was barely steady, but no further changes were announced. The 95 per cent grade settled at 98c.@$1 per gal., in bbl., the inside figure obtaining on carload lots. Production of methanol in August amounted to 649,063 gal., which compares with 645,673 gal. in July.

Trade Notes

The plant of the Mitchell Rand Mfg. Co. at Jersey City was damaged by fire last Monday. The loss was about $200,000. In addition to damage to the buildings and finished products, large quantities of linseed oil and rosin were destroyed.

L. B. Jackson, president of the International Petroleum Exposition, in an address delivered at Tulsa, Okla., last week, advocated the formation of a permanent world-wide petroleum congress embracing all branches of the industry.

John E. Falkingham, formerly treasurer of Percival E. Falkingham, Inc., has resigned from that company and is now located at 95 Liberty St., New York, where he will deal in chemicals under his own name.

Brewer & Co. will build a new 5-story structure on Arctic St., Worcester, Mass., in which will be centered the heavy chemical department of the company.

The total output of gypsum rock in Canada during 1922 amounted to 484,629 tons, of which 145,954 tons (30 per cent) were calcined, according to revised figures of the dominion Bureau of Statistics.

A French decree of Aug. 5, 1923, modifies the import duties, generally by way of reductions, on a number of articles imported into New Caledonia. The list of articles affected includes cottonseed oil, sulphuric acid and dynamite.

Sidney L. Willson of Holyoke, Mass., president of the American Writing Paper Co., has been appointed ancillary receiver by Federal Judge Lowell of Boston, under a bond of $50,000. Federal Judge Hand of New York recently appointed Willson receiver, under bond of $50,000.

Edward F. Ryan, manager of the fish oil department of the Swan & Finch Co., died at his home in Brooklyn on Oct. 5.

Coal-Tar Products

Phenol Marked Down 2c. by One Operator—Naphthalene Flake Lower—Benzene Irregular—Pyridine Scarce

THE feature in the market for coal-tar products was the easier position of U.S.P. phenol. One factor announced a reduction of 2c. per lb. from the 28c. basis, and it was generally felt that other traders will have to meet the decline. The reduction did not surprise the trade, for it had been intimated that bids at concessions from the open market basis would have met with consideration. Some producers of synthetic phenol say that prices are getting close to cost and lower quotations might restrict production. Naphthalene flake was under pressure and lower prices were named on prompt as well as nearby material. Moderate call for benzene was reported, but in most instances buyers' views were below the market and few important contracts were placed. Closing prices for 90 per cent benzene were more or less nominal. Solvent naphtha was in limited supply and firm prices prevailed in producing circles. Several shipments of cresylic acid arrived here from foreign ports. Pyridine for immediate delivery was almost unobtainable and extremely high prices were named in some directions. More buying interest was in evidence in salicylates, despite the decline in phenol, and prices appeared to steady.

Importations of coal-tar products into the United States for the 8 months ended with August, according to the Department of Commerce, were valued at $10,798,700, which compares with $7,044,881 for the corresponding period a year ago. Exports of coal-tar products for the 8 months ended with August were valued at $9,116,523, against a total of $5,252,471 for the corresponding period a year ago.

Aniline Oil and Salt—Offerings were not pressing on the market and leading producers regarded the undertone as steady. Aniline oil held at 16c. per lb., in drums, immediate shipment from works. The salt was nominally unchanged at 22@23c. per lb.

Anthracene—A shipment of anthracene arrived at New York from abroad last week. The market was a quiet affair, with prices ranging from 75@80c. per lb., as to seller and delivery.

Benzene—Demand was fair, but with offerings liberal the price situation failed to change for the better. Leading interests continued to offer the 90 per cent material on the basis of 25c. per gal., tank cars, f.o.b. point of shipment, but outside lots could have been secured at concessions. On a round lot it was reported that close to 22c. could have been done. Intermediate makers were not disposed to contract far ahead at prevailing prices. Export demand was limited only. Pure benzene, on spot, in drums, held at 30@32c. per gal., as to quantity and seller.

Creosote—Importations of creosote oil for the 8 months ended with August amounted to 39,974,540 gal., valued at $6,068,017, comparing with 27,869,444, valued at $2,854,500 for the corresponding period a year ago. The markets abroad were quotably unchanged, according to advices received here last week.

Cresylic Acid — The market underwent little if any change. Trading was inactive and prices varied considerably, depending upon the grade and seller. Prices heard ranged from 68@85c. per gal.

Dimethylaniline — Producers quote from 41@42c. per lb., the price depending upon the quantity. Second hands offered scattered lots at 40c. per lb. Demand was slow.

Naphthalene—Competition for business covering shipment goods was keen and prices were easier. On white flake there were sellers at 6@6¼c. per lb., the inside figure obtaining on round lots. Chips were offered for shipment from points nearby at close to 5c. per lb. The foreign market on good grades of crude was nominally unchanged at 2½c. per lb., c.i.f. basis. During the week a shipment arrived from Manchester.

Phenol — A pharmaceutical house came out with an open reduction in the price of U.S.P. phenol, establishing the selling basis at 26c. per lb., in drums. Others continued to quote the market at 28c., but the undertone was easy and it was regarded as a certainty that the reduction will be general in a short time. As previously noted the market has been rather unsettled and with demand not up to expectations certain producers were ready to consider bids at concessions. A week ago it was reported that 25c. could be done on contract business.

Pyridine—The scarcity continues and prices at the close were wholly nominal. For spot material one trader asked as high as $6 per gal. Pyridine for shipment from abroad was offered at $4.50 @$4.75 per gal. Traders were interested in obtaining spot and nearby material.

Salicylates—No price changes were announced. It was reported that at least one producer was firmer in his views and bids at concessions were turned down in more than one direction. The decline in phenol, according to traders, had no influence upon the market.

Xylene — Offerings of pure xylene have increased and the market was irregular. Prices named by first hands range from 50@55c. per gal., drums included.

Coal-Tar Industry of Netherlands Increases

There has been a rapid and notable development of the manufacture and exportation of coal-tar products in the Netherlands in the past 2 years in which the United States is coming to have a considerable part. This is set forth in a report from Consul-General Anderson at Rotterdam, who states that approximately twenty-five factories are listed in that country at present as manufacturing some product connected with coal tar ranging from roof paint and asphalt paper to the finest chemical products. There has been activity for some time in the coarser forms of this industry, but the development of the higher and finer chemical side of the business has taken place mostly in the past 3 years.

The principal products concerned in the export trade are benzol, which has been sold in France, Germany, Belgium and other European countries, and creosote oil, which has been disposed of to some extent in Belgium, but mostly in the United States. The exportation of creosote oil from the Netherlands to America has been large for several years, but previous to 1922 the oil was mostly of German manufacture. In the past year the declared exports of this commodity to the United States reached $1,505,936, as compared with $1,773,559 in 1921. Of this consignment of oil in 1922, however, only a value of $71,820 was of Dutch origin, the rest being in transit from Germany. In the first 4 months of 1922 the declared exports of creosote oil from the Netherlands to the United States went to $575,065, shipments totaling $47,500 belonging to the Netherlands, while in the corresponding period of the current year they amounted to $341,094, of which $136,500 worth may be classified as Dutch. The extent to which the trade has increased is indicated by the fact that the value of the exports of creosote oil for the first 4 months of 1923 is substantially the same as that for the whole of 1922.

There has been a similar increase in the exports of benzol, particularly to Germany, France and Switzerland. With the exception of naphthalene, there was an advance in shipments of all such products in 1922 as compared with 1921, while the exportation thus far the current year shows a large increase over that of the same period of 1922. Although creosote oil, most of which goes to the United States, is the largest item in the list, there has been increasing inquiry from American importers for naphthalene and other products.

There was a slight decrease in the imports of aniline dyes into Holland in 1922, as compared with 1921, but the imports thus far this year are much larger than those of the same period of 1922 and apparently dye manufacturers of the Netherlands are not able to hold their own against German competition. Nearly all these imports come from Germany, although Switzerland has a fair trade.

Vegetable Oils and Fats

Spot Cottonseed Steady—Government Flaxseed Report Favorable —China Wood Lower—Coconut Unsettled

THERE was a better call for prompt shipment crude cottonseed oil and a firmer feeling featured the market. Linseed oil did not change much one way or the other, despite the favorable report on the condition of the domestic flaxseed crop. Coconut was unsettled on the coast on resale offerings. China wood on spot was lower. Refined rapeseed oil closed higher abroad. Palm oils were inactive. Tallow and greases ruled steady on moderate offerings.

Cottonseed Oil—The market for oil was irregular, fluctuating in sympathy with cotton and lard. Everything considered the option market on the Produce Exchange gave a good account of itself. Towards the close the undertone seemed to steady, reflecting a tight situation in October oil. Refiners operated on both sides of the market. Efforts were made to depress the October option, but the offerings were not large enough to bring out sustained pressure and the longs would not bulge from their position. Quite a number of traders held to the belief that a squeeze in October oil cannot be avoided. The movement of crude from the mills has been larger, but the buying has been fairly active and prices paid were virtually on a parity with quotations of a week ago. A large producer of compound paid 8¾c. for immediate crude, f.o.b. Texas points, while late October sold at 8¼c. per lb. November crude sold quite recently at 8c., but no offerings at this figure could be located towards the close of the week. Prices paid for seed were considered high, ranging from $45@$48 per ton, with holders not anxious sellers at the inside figure. Lower prices for cotton were offset, as a market factor, by higher lard. Cash trade in oil was fair, while compound business was described as good. Lard compound sold at 13¼@13⅜c. per lb., in bbl., carload basis. Spot prime summer yellow cottonseed oil sold ex store at 12⅞@13c. per lb., in bbl.

Linseed Oil—The gain of 223,000 bu. in the October forecast on flaxseed production was too insignificant to affect the market. Crushers generally regard the Government estimate as a little high and in most instances are calculating on production of not more than 17,000,000 bu. Traders look to the Argentine for the key to the situation and everything hinges on the new crop in the South American republic. Holdings of old crop Argentine seed are reported small and the strength of the Buenos Aires market was regarded as a sign that shorts have about given up hope. Trading in oil was slow throughout the week and the appearance of resale material took some of the strength out of market. Stocks of oil in the hands of crushers are reported moderate and this, together with the strength in seed, tends to support prices. Several cars of November oil resold at 90c. per gal., cooperage basis. Crushers held out for 94c. on October, 93c. on November, 92c. on December and 90@91c. on January forward. Shipments of Argentine seed since January 1 amounted to 41,000,000 bu., of which total 20,500,000 bu. were consigned to the United States. India reported a larger volume of buying orders from the United Kingdom and the Continent.

Improvement in the condition of the flaxseed crop was reported by the Department of Agriculture in the October 1 forecast, the yield being placed at 19,623,000 bu., an increase of 223,000 bu. in the past month. The condition was estimated at 80.4 per cent of normal, comparing with 79 per cent on September 1. The yield per acre was estimated at 8.6 bu., against 8.5 bu. a month ago. The production of flaxseed in the United States in 1922 was estimated at 12,238,000 bu.

Stocks of flaxseed at Minneapolis at the close of last week were placed at 430,727 bu., against 359,526 bu. a week ago. There was a firmer market for cake.

China Wood Oil—Several shipments came through from Hankow and this brought out freer offerings of spot oil. The market closed at 21½c. per lb., spot and nearby delivery. On the Pacific coast there were sellers at 20c. per lb., tank cars, all positions. Demand was quiet.

Coconut Oil—Domestic Ceylon type oil was offered at 8c. per lb., sellers' tanks, November shipment from the coast. Manila oil on the coast closed at 8¼@8¼c. per lb., as to position. Locally the market settled at 8⅝@8¾c. per lb., as to seller and delivery. Demand was quiet and the undertone easier. Copra was quotably unchanged at 4¾@5c. per lb., c.i.f. Pacific coast ports, the outside figure obtaining on Cebu sun dried.

Palm Oils—Imported reported a quiet week, but the recent strength in tallow supported the market. Lagos for shipment held at 7⅝c. per lb., while Niger closed at 7¼c. per lb., c.i.f. terms.

Rapeseed Oil—Cables from Hull reported firmer prices, refined rapeseed oil settling at 76c. per gal., in bbl., import terms. On spot there was trading in resale material at concessions from the prevailing cost of import.

Soya Bean Oil—Stocks were limited and this made the market a nominal affair in regard to prices. Crude oil on spot held around 9¼c. per lb., sellers' tanks, duty paid.

Cod Oil—English cod oil was offered for shipment at 59c. per gal., c.i.f. New York. Newfoundland closed at 65@67c. per gal.

Menhaden Oil—No sales of crude were reported. The market was steady at 47½c. per gal., tanks, factory. Fishing was better in the past week.

Tallow, Etc.—Extra tallow held at 7¾c. per lb., with the tone steady. Yellow grease was steady at 6⅝c. Oleo stearine sold at 12⅝c., carload lots. No. 1 oleo oil was raised to 13¾c. per lb., in bbl.

Miscellaneous Materials

Antimony—Trading was inactive. Prices were irregular, closing on the basis of 7¼c. per lb. for Chinese, immediate delivery.

Barytes—Importations were larger, but this failed to influence sellers of the domestic product. White floated barytes were unchanged at $28 per ton, carload lots, f.o.b. St. Louis.

Glycerine—Competition for contract business in the chemically pure grade was keen and prices presented an unsettled appearance. Sales went through at 16¼c. per lb., drums included, carload lots. Most refiners held out for 16¾@17c. per lb. on spot business. Dynamite closed at 16¼c. asked, with demand quiet. Crude was irregular, but final prices showed little change compared with a week ago. Soap lye, basis 80 per cent, was offered at 11c. per lb. in the New York district, while in the West there were offerings at 10¾c. per lb., loose, carload lots. Saponification settled at 12¼@12½c. per lb., loose, carload lots.

Lithopone—The market was quiet, but first hands reported a steady undertone, maintaining prices on the basis of 7c. per lb., bags, carload lots.

Shellac—Offerings on spot were larger, following closely upon the receipt of several shipments from Calcutta and this unsettled prices in some quarters of the trade. T.N. sold at prices ranging from 62@65c. per lb. Imports for the 8 months ending with August amounted to 27,052,085 lb., against 16,992,248 lb. a year ago.

White Lead—New business was not active, but shipments against existing contracts were large enough to steady the market. There was no change in the position of the metal, pig lead holding at 6.85c. per lb. Standard dry white lead (basic carbonate) was offered by leading producers at 9¾c. per lb., in casks, carload lots. The sulphate was unchanged at 8¾c. per lb.

Zinc Oxide—Rubber manufacturers have been buying sparingly. The market was quotably unchanged, first hands quoting the American process, lead free, at 8c. per lb., carload lots. On the leaded grades 7c. was asked. French process, red seal, held at 9¾c. per lb.

Asbestos—First hands reported the market was unchanged so far as prices were concerned. Crude No. 1, $350@$500; No. 2, $250@$300; spinning fibers, $125@$150; magnesia and compressed sheet fibers, $75@$110; shingle stock, $50@$65; paper stock, $30@$40; cement stock, $17@$20; floats, $8@$12. All f.o.b. mines, per short ton, Quebec.

Imports at the Port of New York

October 5 to October 10

ACIDS—Cresylic—60 dr., Glasgow, Caldwell & Co.; 10 dr., London, Celluloid Co. **Benzoic**—3 cs., London, H. J. Baker & Bros. **Acetic**—10 bbl., La Guaira, W. R. Grace & Co. **Tartaric**—50 keg, London, Order.

ALCOHOL—151 csk. butylic, Bordeaux, Commercial Solvents Corp.

ALBUMEN — 50 cs., Shanghai, F. A. Cundill & Co.; 56 cs., Shanghai, Standard Bank of South Africa; 56 cs., Shanghai, Lee, Higginson & Co.

ANTHRACENE—305 bg. crude, Manchester, Order.

ANTIMONY REGULUS — 1,000 cs., Shanghai, C. F. Smilie & Co.; 700 cs., Hankow, Union Trust Co.

ANTIMONY SULPHIDE—7 csk., London, L. H. Butcher & Co.

ARGOLS—25 csk., Naples, Tartar Chemical Wks.

ARSENIC—10 keg, London, Order.

ASBESTOS — 111 bg., London, Irving Bank-Col. Trust Co.

BARYTES — 300 bg., Bremen, L. H. Butcher & Co.; 200 bg., Bremen, New York Trust Co.; 300 bg., Bremen, Order; 200 bg., Bremen, N. Y. Trust Co.; 167 bg., Bremen, Baer Bros.; 500,000 kilos, Bremen, Order; 200 bg., Bordeaux, L. A. Salomon & Bros.; 1,000 bg., Sevilla, Order.

BONE BLACK — 100 bbl., Antwerp, National City Bank.

BRONZE POWDER—8 cs., Bremen, Uhlfelder & Co.; 40 cs., Bremen, Baer Bros.; 24 cs., Hamburg, Order.

CALCIUM NITRATE — 22 bg., Brevik, Order.

CASEIN—100 bg., Bordeaux, Order; 494 bg., Hamburg, Bank of the Manhattan Co.

CALCIUM PERMANGANATE—50 csk., Hamburg, Norvell Chemical Corp.

CHALK—500,000 kilos (bulk), Dunkirk, J. W. Higman Co.; 1,485,000 kilos, Dunkirk, Taintor Trading Co.; 500 bg., Antwerp, Bankers Trust Co.

CHEMICALS — 10 pkg., Bremen, Mallinckrodt Chemical Works; 15 cs., Antwerp, Hoffmann, La Roche Chemical Co.; 168 bg., Glasgow, E. M. Sergeant & Co.; 17 csk., Bremen, Roessler & Hasslacher Chemical Co.; 10 cs., Havre, Lehn & Fink; 250 bg., Rotterdam, Roessler & Hasslacher Chemical Co.; 240 cs., Rotterdam, W. Van Doorn; 60 bbl., Hamburg, Chaplain & Bibbo; 66 csk., Hamburg, Goldschmidt Corp., 21 csk., Hamburg, Jungmann & Co., 1 cs., Hamburg, Order.

CITRATE LIME—211 csk., Messina, C. Pfizer & Co.

COAL-TAR DISTILLATE—78 dr., Liverpool, Order.

COBALT—2 cs. metallic, Liverpool, De Courcey Browne & Co.

COLORS—27 pkg., Havre, Sandoz Chemical Co.; 11 cs. Havre, Schall & Co.; 7 csk., Havre, American Exchange National Bank; 11 csk., Havre, Geigy Co.; 17 csk., Havre, Ciba Co.; 32 csk. earth, Bremen, Fezandie & Sperrie; 28 csk. aniline, Rotterdam, Kuttroff, Pickhardt & Co.; 14 csk. and 1 cs. aniline, Rotterdam, H. A. Metz & Co.; 95 csk., Rotterdam, Grasselli Chemical Co.; 6 csk. aniline, Rotterdam, Kuttroff, Pickhardt & Co.; 8 bbl. aniline, Rotterdam, American Exchange National Bank; 200 bg. earth, Leghorn, Reichard-Coulston, Inc.; 34 csk. red earth, Bristol, Reichard-Coulston, Inc.; 480 bg. do. and 50 bbl. do., Bristol, G. Collins & Co.; 71 csk. do., Bristol, Order; 8 csk. aniline, Hamburg, Franklin Import & Export Co.

CRUDE OIL—46,000 bbl., Tampico, Standard Oil of New Jersey; 70,000 bbl., Tampico, Standard Oil of New Jersey; 60,000 bbl., Tampico, Huasteca Petroleum Co.; 60,000 bbl., Tampico, Texas Co.

CREAM OF TARTAR — 50 csk., Marseilles, French-American Banking Corp.; 54 csk., Marseilles, Brown Bros. & Co.

DIVI-DIVI—397 bg., Curacao, De Lima Correa & Cortissoz.

DYESTUFFS—5 csk., Genoa, American Exchange National Bank; 4 csk., Genoa, Pennrich & Co.; 12 bbl., Genoa, Bank of the Manhattan Co.; 4 bbl., Genoa Irving Bank-Col. Trust Co.

EPSOM SALT—1,000 bg. Hamburg, Innis, Speiden & Co.

FUSEL OIL—8 dr., Rotterdam, N. Y. Trust Co.; 1 dr., Dunkirk, Order; 4 dr., Barcelona, Maas & Waldstein.

FULLERS EARTH—300 bg., London, L. A. Salomon & Bros.; 250 bg., Bristol, L. A. Salomon & Bros.

GAMBIER — 254 cs., Singapore, L. C. Littlejohn & Co.; 524 cs., Singapore, Order.

GLAUBER SALT—100 bbl., Hamburg, Superfos Co.

GLYCERINE — 50 dr. crude, London, Marx & Rawolle.

GUMS—300 bg. copal, Antwerp, Brown Bros. & Co.; 287 bg. damar, Singapore, Kidder, Peabody & Co.; 50 bg. do., Singapore, L. C. Gillespie & Sons; 444 bg. do., Singapore, Order; 150 bg. copal, Singapore, L. C. Gillespie & Co.; 50 cs. do., Singapore, Baring Bros. & Co.; 245 bg. do., Singapore, Order; 16 cs. damar, Batavia, Order; 200 cs. damar, Padang, Order; 317 pkg. copal, Macassar, Kidder, Peabody Acceptance Corp.; 342 bskt., Macassar, Irving Bank-Col. Trust Co.; 1,132 bskt. copal, 67 cs. do. and 9 bg. do., Macassar, Order; 40 cs. tragacanth, London, Order; 88 cs. tragacanth, London, Thurston & Braidich; 95 bg. arabic, London, Order; 200 bg. arabic, Port Sudan, Anderson, Hillier Co.; 100 cs. damar, Singapore, Order.

IRON OXIDE—268 bbl., Malaga, Hummel & Robinson Corp.; 100 bbl., Malaga, Scott Libby Co.; 162 bbl., Malaga, C. K. Williams & Co.; 265 bbl., Malaga, Reichard-Coulston, Inc.; 40 bbl., Malaga, C. B. Chrystal & Co.; 2 bbl., Malaga, E. M. & F. Waldo.

LITHOPONE—60 csk., Bremen, Order.

LOGWOOD EXTRACT—100 bbl., Cape Haytian, Logwood Mfg. Corp.; 10 csk., Havre, Irving Bank-Col. Trust Co.

MAGNESITE — 313 bg., Rotterdam, Speiden, Whitfield Co.

MYROBALANS — 7,600 pkt. whole and 2,240 pkt. crushed, Calcutta, Order.

MANGANESE DIOXIDE—55 tons (bulk), Coquimbo, W. R. Grace & Co.

MANGANESE BORATE—10 csk., Bristol, Order.

NAPHTHALENE—640 bg., Manchester, Order.

NICKEL SULPHATE—54 csk., Bristol, Order.

OCHER—507 bbl., Marseilles, Reichard-Coulston, Inc.; 175 bbl., Marseilles, F. B. Vandegrift & Co.; 142 csk., Marseilles, Reichard-Coulston, Inc.; 19 csk., Marseilles, J. L. Smith & Co.; 19 csk., Bordeaux, L. H. Butcher & Co.

OILS—Cod—100 csk., St. Johns, H. W. Dickinson; 300 csk., St. Johns, National Oil Products Co.; 70 csk., Halifax, Cook & Swan Co. **China Wood**—302 csk., Hankow, Irving Bank-Col. Trust Co.; 703 csk., Hankow, International Banking Corp.; 443 cs., Hankow, Jardine, Matheson & Co.; 158 cs., Hankow, National City Bank; 294 cs., Hankow, Standard Bank of South Africa; 1,244 cs. and 670 tons (bulk), Hankow, Order. **Olive**—2,085 bbl., Sevilla, Order. **Palm**—76 csk., Lagos, Grace Bros. & Co.; 1 csk., Lagos, African & Eastern Trading Corp. **Peanut**—290 csk., Bordeaux, American Shipping Co.; 25 csk., Bordeaux, Order. **Rapeseed**—10 bbl., Rotterdam, Loos & Dilworth. **Sperm**—10 bbl., Bergen, Order.

OIL SEEDS—Linseed—8,910 bg., Rosario, Bunge North American Grain Corp.

PARAPHENYLENEDIAMINE — 11 cs., Hamburg, Franklin Import & Export Co.

PLUMBAGO—169 bbl., Colombo, Order.

POTASSIUM SALTS—100 bbl. prussiate, Antwerp, E. Suter & Co.; 73 dr. perchlorate, Antwerp, Hummel & Robinson Corp.; 16 dr. alum, Antwerp, Cooper & Cooper; 300 bbl. sulphate, Bremen, Potash Importing Corp. of Am.; 3,000 bbl. chlorate, Hamburg, Irving Bank-Col. Trust Co.; 1,000 bbl. chlorate, Mechanics & Metals National Bank; 700 bbl. and 300 csk. chlorate, Marseilles, Order.

PYRIDINE—9 dr., Rotterdam, Lunham & Moore.

QUEBRACHO—6,002 bg., Buenos Aires, C. A. Andressen & Sons; 6,229 bg., Buenos Aires, Fourth Atlantic National Bank of Boston; 1,021 bg., Buenos Aires, First National Bank of Boston; 1,551 bg., Buenos Aires, Goldman, Sachs & Co.; 5,010 bg., Buenos Aires, Order.

SAL AMMONIAC—100 csk., Bristol, C. DeP. Field Co.; 14 csk., Hamburg, Order.

SHELLAC — 600 bg., Calcutta, Anglo South American Bank; 600 cs., Calcutta, First National Bank of Boston; 200 bg., Calcutta, Irving Bank-Col. Trust Co.; 100 bg., Calcutta, Standard Bank of South Africa; 2,004 pkg., Calcutta, Order; 278 bg., Southampton, Rogers, Pyatt Shellac Co.; 200 bg., London, Order; 100 chests and 25 cs., London, Order; 125 pkg., London, Order.

SIENNA — 40 csk., Genoa, Reichard-Coulston, Inc.; 13 csk., Genoa, J. L. Smith & Co.

SILVER SULPHIDE — 3 cs., Callao, Markt & Schaefer Co.

SODIUM SALTS — 37 bbl. phosphate, Antwerp, E. Suter & Co.; 3,922 sk. nitrate, Iquique, A. Gibbs & Co.; 4,873 bg. and 72 csk. nitrate, Brevik, Order; 4 csk. hydrosulphite, Havre, E. Suter & Co.; 2,600 bg. nitrate, Antofagasta, W. R. Grace & Co.; 18,084 sk., Iquique, W. R. Grace & Co.; 200 bg. silico fluoride, Rotterdam, Order; 120 bbl. hyposulphite, Hamburg, Order; 10,357 bg. nitrate, Antofagasta, W. R. Grace & Co.; 518 csk. hyposulphite, Marseilles, Order.

STRONTIUM NITRATE—19 csk., Bremen, Order.

STRONTIUM SPAR — 500 bg., Bristol, Order.

SUMAC—350 bg. ground, Palermo, Order.

TANNIN—20 sk., Corral, Order.

TARTAR—90 bg., Marseilles, Royal Baking Powder Co.; 2,715 bg., Buenos Aires, Tartar Chemical Works; 43 bg., Antwerp, Order; 117 sk., Sevilla, Tartar Chemical Works; 557 sk., Marseilles, C. Pfizer & Co.; 466 sk., Marseilles, Tartar Chemical Works; 234 sk., Barcelona, Harshaw, Fuller & Goodwin.

TARTRATE LIME—197 bg., Antwerp, Order.

ULTRAMARINE BLUE—1 csk., Glasgow, Sayles Finishing Plant; 5 csk., Antwerp, H. Kohnstamm & Co.

WAXES—500 bg. montan, Bremen, Order; 50 cs. spermacetti, Glasgow, Order; 111 bg. carnauba, Santos, Battery Park National Bank; 55 bg. carnauba, Santos, Strohmeyer & Arpe Co.; 335 bg. do., Santos, Lazard Freres; 55 bg. do., Santos, Order; 1,360 bg. paraffine, London, Order; 50 cs. bees, Hamburg, W. Schall & Co.; 40 bg. bees, Constantinople, Order; 64 bg. bees, Talcahuana, E. Barufka & Co.

WHITING—5,441 bg., Dunkirk, Taintor Trading Co.

WOOL GREASE — 50 bbl., Hamburg, National City Bank.

ZINC OXIDE — 50 bbl., Marseilles, Reichard-Coulston, Inc.; 40 cs., London, Order.

ZINC WHITE — 50 csk., Rotterdam, Roessler & Hasslacher Chemical Co.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0.25 – $0.25½
Acid, acetic, 28%, bbl.	100 lb.	3.38 – 3.50
Acetic, 56%, bbl.	100 lb.	6.75 – 7.00
Acetic, 80%, bbl.	100 lb.	9.58 – 9.83
Glacial, 99½%, bbl.	100 lb.	12.00 – 12.78
Acetic anhydride, 85%, dr.	lb.	.38 – ....
Boric, bbl.	lb.	.10 – ....
Citric, kegs	lb.	.49 – .50
Formic, 85%	lb.	.12 – .14
Gallic, tech.	lb.	.45 – .50
Hydrofluoric, 52%, carboys	lb.	.11 – .12
Lactic, 44%, tech., light, bbl.	lb.	.11½ – .12
22% tech., light, bbl.	lb.	.05½ – .06
Muriatic, 18° tanks	100 lb.	.90 – 1.00
Muriatic, 20°, tanks	100 lb.	1.00 – 1.10
Nitric, 36°, carboys	lb.	.04½ – .05
Nitric, 42°, carboys	lb.	.06 – .06½
Oleum, 20%, tanks	ton	18.50 – 19.00
Oxalic, crystals, bbl.	lb.	.11½ – .12
Phosphoric, 50% carboys	lb.	.07½ – .08½
Pyrogallic, resublimed	lb.	1.50 – 1.60
Sulphuric, 60°, tanks	ton	9.00 – 11.00
Sulphuric, 60°, drums	ton	13.00 – 14.00
Sulphuric, 66°, tanks	ton	15.00 – 16.00
Sulphuric, 66° drums	ton	20.00 – 21.00
Tannic, U.S.P., bbl.	lb.	.65 – .70
Tannic, tech., bbl.	lb.	.45 – .50
Tartaric, imp., powd., bbl.	lb.	.30½ – .31
Tartaric, domestic, bbl.	lb.	.34½ – ....
Tungstic, per lb.	lb.	1.10 – 1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 – .28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.78 – ....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.75 – ....
Alcohol, methyl (see Methanol)		
Alcohol, denatured, 190 proof		
No. 1, special bbl.	gal.	.46 – ...
No. 1, 190 proof, special, dr.	gal.	.40 – ...
No. 1, 188 proof, bbl.	gal.	.47 – ...
No. 1, 188 proof, dr.	gal.	.41 – ...
No. 5, 188 proof, bbl.	gal.	.45 – ...
No. 5, 188 proof, dr.	gal.	.39 – ...
Alum, ammonia, lump, bbl.	lb.	.03½ – .04
Potash, lump, bbl.	lb.	.03½ – .04½
Chrome, lump, potash, bbl.	lb.	.06 – .07
Aluminum sulphate, com., bags	100 lb.	1.40 – 1.50
Iron free bags	lb.	2.40 – 2.50
Aqua ammonia, 26°, drums	lb.	.07 – .07½
Ammonia, anhydrous, cyl.	lb.	.30 – .30½
Ammonium carbonate, powd. casks, imported	lb.	.09½ – .10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 – .14
Ammonium nitrate, tech., casks	lb.	.10 – .11
Amyl acetate tech., drums	gal.	4.50 – 4.75
Antimony Sulphuret, golden	lb.	.19 – .20
Arsenic, white, powd., bbl.	lb.	.11½ – .12
Arsenic, red, powd., kegs	lb.	.15 – .15½
Barium carbonate, bbl.	ton	68.00 – 70.00
Barium chloride, bbl.	ton	82.00 – 88.00
Barium dioxide, drums	lb.	.18 – .18½
Barium nitrate, casks		.07½ – .08
Blanc fixe, dry, bbl.	lb.	.04 – .04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.50 – 1.75
Spot N. Y. drums	100 lb.	2.00 – 2.10
Borax, bbl.	lb.	.05½ – .05½
Bromine, cases	lb.	.28 – .30
Calcium acetate, bags	100 lb.	4.00 – 4.05
Calcium arsenate, dr.	lb.	.14 – .15
Calcium carbide, drums	lb.	.05½ – .05¾
Calcium chloride, fused, dr. wks.	ton	21.00 – ....
Gran. drums works	ton	27.00 – ....
Calcium phosphate, mono, bbl.	lb.	.06½ – .07
Camphor, cases	lb.	86 – .87
Carbon bisulphide, drums	lb.	.07 – .07½
Carbon tetrachloride, drums	lb.	.09 – .09½
Chalk, precip.—domestic, light, bbl.	lb.	.04½ – .04½
Domestic, heavy, bbl.	lb.	.03½ – .03½
Imported, light, bbl.	lb.	.04½ – .05
Chlorine, liquid, tanks, wks.	lb.	.04½ – .05
Cylinders, 100 lb., wks.	lb.	.05½ – .06½
Cylinders, 100 lb., spot	lb.	.08½ – .09
Chloroform, tech., drums	lb.	.28 – .32
Cobalt, oxide, bbl.	lb.	2.10 – 2.25
Copperas, bulk, f.o.b. wks.	ton	21.00 – 24.00
Copper carbonate, bbl.	lb.	.18 – .19
Copper cyanide, drums	lb.	.47 – .50
Copper sulphate, dom., bbl., 100 lb.		4.90 – 5.00
Imp. bbl.	100 lb.	4.50 – 4.60
Cream of tartar, bbl.	lb.	.24 – .25½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 – 2.00
Epsom salt, imp., tech., bags	100 lb.	.90 – 1.00
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 – 2.50
Ether, U.S.P., resale, dr.	lb.	.13 – .15
Ethyl acetate, 85%, drums	gal.	.80 – .81
Ethyl acetate, ether, 98% to 100%	gal.	$0.95 – $1.00
Formaldehyde, 40%, bbl.	lb.	.11½ – .12
Fullers earth—f.o.b. mines	ton	18.00 – 20.00
Fusel oil, ref., drums	gal.	.... – ....
Fusel oil, crude, drums	gal.	4.25 – ....
Glaubers salt, wks., bags	100 lb.	1.20 – 1.40
Glaubers salt, imp., bags	100 lb.	.90 – .95
Glycerine, c.p., drums extra	lb.	.16½ – .17
Glycerine, dynamite, drums	lb.	.16½ – ....
Glycerine, crude 80%, loose	lb.	.11 – ....
Iron oxide, red, casks	lb.	.12 – .18
Lead:		
White, basic carbonate, dry, casks	lb.	.09½ – .09½
White, basic sulphate, casks	lb.	.08½ – .09
White, in oil, kegs	lb.	.11½ – .11½
Red, dry, casks	lb.	.10½ – .10½
Red, in oil, kegs	lb.	.13 – .14½
Lead acetate, white crys., bbl.	lb.	.14 – .14½
Brown, broken, casks	lb.	.13 – .13½
Lead arsenate, powd., bbl.	lb.	.18 – .20
Lime-Hydrated, bg, wks.	ton	10.50 – 12.50
Bbl., wks.	ton	18.00 – 19.00
Lime, Lump, bbl.	280 lb.	3.63 – 3.65
Litharge, comm., casks	lb.	.10½ – .10½
Lithophone, bags	lb.	.07 – .07½
in bbl.	lb.	.07½ – .07½
Magnesium carb., tech., bags	lb.	.08 – .08½
Methanol, 95%, bbl.	gal.	.98 – 1.00
Methanol, 97%, bbl.	gal.	1.00 – 1.02
Methyl-acetone, t'ks	gal.	1.15 – ....
Nickel salt, double, bbl.	lb.	.10½ – ....
Nickel salts, single, bbl.	lb.	.11½ – ....
Phosgene	....	.60 – .75
Phosphorus, red, cases	lb.	.... – ....
Phosphorus, yellow, cases	lb.	.35 – .40
Potassium bichromate, casks	lb.	.09½ – .09¾
Potassium bromide, gran., bbl.	lb.	.19 – .20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½ – .06¾
Potassium chlorate, powd.	lb.	.07½ – .08½
Potassium cyanide, drums	lb.	.47 – .52
Potassium, first sorts, cask	lb.	.07½ – .07¾
Potassium hydroxide (caustic potash) drums	lb.	.07 – .07½
Potassium iodide, cases	lb.	3.65 – 3.75
Potassium nitrate, bbl.	lb.	.07½ – .09
Potassium permanganate, drums	lb.	.18 – .18½
Potassium prussiate, red, casks	lb.	.60 – .63
Potassium prussiate, yellow, casks	lb.	.29 – .30
Salammoniac, white, gran., casks, imported	lb.	.06½ – .06½
Salammoniac, white, gran., b l., domestic	lb.	.07½ – .07½
Gray, gran., casks	lb.	.08 – .09
Salsoda, bbl.	100 lb.	1.20 1.40
Salt cake (bulk)	ton	24.00 – 25.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.33 – ....
bags, contract	100 lb.	1.45 – ....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.42 – ....
bags, contract	100 lb.	1.51 – ....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.16 – ....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.60 – 3.85
Soda, caustic, solid, 76% f. a. s. N. Y.	100 lb.	3.05 – 3.10
Sodium acetate, works, bags	lb.	.05½ – .05¾
Sodium bicarbonate, bulk	100 lb.	1.75 – ....
330-lb. bbl.	100 lb.	2.00 – ....
Sodium bichromate, casks	lb.	.07½ – .07¾
Sodium bisulphate (niter cake)	ton	6.00 – 7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ – .04½
Sodium chlorate, kegs	lb.	.06½ – .07
Sodium chloride	long ton	12.00 – 13.00
Sodium cyanide, cases	lb.	.19 – .22½
Sodium fluoride, bbl.	lb.	$0.08½ – $0.10½
Sodium hyposulphite, bbl.	lb.	.02½ – .02¾
Sodium nitrite, casks	lb.	.07½ – ....
Sodium peroxide, powd., cases	lb.	.28 – .30
Sodium phosphate, dibasic, bbl.	lb.	.03½ – .04
Sodium prussiate, yel. drums	lb.	.13½ – .14
Sodium salicylic, drums	lb.	.40 – .42
Sodium silicate (40°, drums)	100 lb.	.75 – 1.15
Sodium silicate (60°, drums)	100 lb.	1.75 – 2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03 – .04
Sodium sulphite, crys., bbl.	lb.	.03½ – .03½
Strontium nitrate, powd., bbl.	lb.	.11 – .12
Sulphur chloride, yel drums	lb.	.04½ – .05
Sulphur, crude	ton	18.00 – 20.00
At mine, bulk	ton	16.00 – 18.00
Sulphur, flour, bag	100 lb.	2.25 – 2.35
Sulphur, roll, bag	100 lb.	2.00 – 2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 – .08½
Tin bichloride, bbl.	lb.	.12 – .12½
Tin oxide, bbl.	lb.	.47 – ....
Tin crystals, bbl.	lb.	.31½ – .32
Zinc carbonate, bags	lb.	.14 – .14½
Zinc chloride, gran, bbl.	lb.	.06½ – .06½
Zinc cyanide, drums	lb.	.37 – .38
Zinc oxide, , lead free, bbl.	lb.	.08 – .08½
5% lead sulphate, bags	lb.	.07½ – ....
10 to 35 % lead sulphate, bags	lb.	.07 – ....
French, red seal, bags	lb.	.09½ – ....
French, green seal, bags	lb.	.10½ – ....
French, white seal, bbl.	lb.	.12 – ....
Zinc sulphate, bbl.	100 lb.	2.75 – 3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 – $0.70
Alpha-naphthol, ref., bbl.	lb.	.65 – .80
Alpha-naphthylamine, bbl.	lb.	.35 – .36
Aniline oil, drums	lb.	.16 – .16½
Aniline salts, bbl.	lb.	.22 – .23
Anthracene, 80%, drums	lb.	.75 – .80
Anthracene, 80%, imp., drums, duty paid	lb.	.65 – .70
Anthraquinone, 25%, paste, drums	lb.	.80 – .85
Benzaldehyde U.S.P., carboys	lb.	1.50 – ....
f.f.c. drums	lb.	1.60 – ....
tech, drums	lb	75 ....
Benzene, pure, water-white, tanks and drums	gal.	.27 – ....
Benzene, 90%, tanks & drums	gal.	.25 – ....
Benzidine base, bbl.	lb.	.80 – .85
Benzidine sulphate, bbl.	lb.	.75 – ....
Benzoic acid, U.S.P., kegs	lb.	.80 – 85
Benzoate of soda, U.S.P., bbl.	lb.	.65 – .70
Benzyl chloride, 95-97%, ref., drums	lb.	.45 – ....
Benzyl chloride, tech., drums	lb.	.30 – .35
Beta-naphthol, tech., bbl.	lb.	.21 – .22
Beta-naphthylamine, tech.	lb.	.75 – .80
Cresol, U.S.P., drums	lb.	.25 – .29
Ortho-cresol, drums	lb.	.28 – .32
Cresylic acid, 97%, works drums	gal.	.75 – .85
95-97%, drums, works	gal.	.70 – .75
Dichlorbenzene, drums	lb.	.06 – .08
Diethylaniline, drums	lb.	.50 – .60
Dimethylaniline, drums	lb.	.41 – .42
Dinitrobenzene, bbl.	lb.	.19 – .20
Dinitrochlorbenzene, bbl.	lb.	.21 – .22
Dinitronaphthalen, bbl.	lb.	.30 – .32
Dinitrophenol, bbl.	lb.	.35 – .40
Dinitrotoluen, bbl.	lb.	.20 – .22
Dip oil, 25%, drums	gal.	.25 – .30
Diphenylamine, bbl.	lb.	.50 – .52
H-acid, bbl.	lb.	.75 – .80
Meta-phenylenediamine, bbl.	lb.	1.00 – 1.05
Michlers ketone, bbl.	lb.	3.00 – 3.50
Monochlorbenzene, drums	lb.	.08 – .10
Monoethylaniline, drums	lb.	.95 – 1.10
Naphthalene, flake, bbl.	lb.	.06 – .06½
Naphthalene, balls, bbl.	lb.	.06½ – .07
Naphthionate of soda, bbl.	lb.	.60 – .65
Naphthionic acid, crude, bbl.	lb.	.55 – .60
Nitrobenzene, drums	lb.	.09½ – .10½
Nitro-naphthalene, bbl.	lb.	.30 – .35
Nitro-toluene, drums	lb.	.13½ – .14½
N-W acid, bbl.	lb.	1.20 – 1.25
Ortho-amidophenol, kegs	lb.	2.30 – 2.35
Ortho-dichlorbenzene, drums	lb.	.15 – .17
Ortho-nitrophenol, bbl.	lb.	1.20 – 1.30
Ortho-nitrotoluene, drums	lb.	.10 – .12
Ortho-toluidine, bbl.	lb.	.18 – .20
Para-amiñophenol, base, kegs	lb.	1.35 – ....
Para-amiñophenol, HCl, kegs	lb.	1.55 – ....
Para-dichlorbenzene, bbl.	lb.	.17 – .20
Paranitroaniline, bbl.	lb.	.73 – .75
Para-nitrotoluene, bbl.	lb.	.60 – .65
Para-phenylenediamine, bbl.	lb.	1.45 – 1.50
Para-toluidine, bbl	lb.	.90 – .95
Phthalic anhydride, bbl.	lb.	.32 – .36
Phenol, U.S.P., dr.	lb.	.26 – .28
Picric acid, bbl.	lb.	.20 – .22
Pyridine, dom., drums	gal.	nominal
Pyridine, imp., drums	gal.	5.00 – 5.50
Resorcinol, tech., kegs	lb.	1.40 – 1.50

Resorcinol, pure, kegs	lb.	$2.15 –	$2.25
R-salt, bbl.	lb.	.55 –	.60
Salicylic acid, tech., bbl.	lb.	.30 –	.32
Salicylic acid, U.SP., bbl.	lb.	.35 –	....
Solvent naphtha, water-white, tanks	gal.	.27 –	....
Crude, tanks	gal.	.24 –	....
Sulphanilic acid, crude, bbl.	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars	gal.	.30 –	.32
Toluene, drums	gal.	.34 –	.36
Xylidine, drums	lb.	.50 –	....
Xylene, pure, drums	gal.	.50 –	.55
Xylene, com., drums	gal.	.32 –	.34
Xylene, com., tanks	gal.	.28 –	.30

Naval Stores

Rosin B-D, bbl. 280 lb.		$5.85 –	....
Rosin E-I, bbl. 280 lb.		5.85 –	....
Rosin K-N, bbl. 280 lb.		5.95 –	....
Rosin W.G.-W.W., bbl. 280 lb.		6.50 –	$7.00
Wood rosin bbl. 280 lb.		5.90 –	6.00
Turpentine, spirits of, bbl.	gal.	1.04 –	....
Wood, steam dist., bbl.	gal.	.90 –	....
Wood, dest. dist., bbl.	gal.	.70 –	....
Pine tar pitch, bbl. 200 lb.		5.50 –	....
Tar, kiln burned, bbl. 500 lb.		11.00 –	....
Retort tar, bbl. 500 lb.		11.00 –	....
Rosin oil, first run, bbl.	gal.	.45 –	....
Rosin oil, second run, bbl.	gal.	.47 –	....
Rosin oil, third run, bbl.	gal.	.50 –	....
Pine oil, steam dist.	gal.	.65 –	....
Pine oil, pure, dest. dist.	gal.	.60 –	....
Pine tar oil, ref.	gal.	.48 –	....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	.... –	.75
Pine tar, ref., thin, bbl.	gal.	.... –	.25
Pinewood creosote, ref., bbl.	gal.	.... –	.52

Animal Oils and Fats

Degras, bbl.	lb.	$0.04 –	$0.04½
Grease yellow, bbl.	lb.	.06½ –	.06½
Lard oil, Extra No. 1, bbl.	gal.	.86 –	.88
Neatsfootoil 20 deg. bbl.	gal.	1.20 –	1.25
No. 1, bbl.	gal.	.92 –	.94
Oleo Stearine		12½ –	....
Oleo oil, No. 1, bbl.	lb.	13½ –	.14
Red oil, distilled, d.p. bbl.	lb.	.09 –	....
Saponified, bbl.	lb.	.09 –	....
Tallow, extra, loose	lb.	.07½ –	....
Tallow oil, acidless, bbl.	gal.	.86 –	.88

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.13 –	....
Castor oil, No. 1, bbl.	lb.	.13½ –	....
Chinawood oil, bbl.	lb.	.21½ –	.22
Coconut oil, Ceylon, bbl.	lb.	.09½ –	.10
Ceylon, tanks, N.Y.	lb.	.08½ –	.08½
Coconut oil, Cochin, bbl.	lb.	.10½ –	.10½
Corn oil, crude, bbl.	lb.	.11 –	....
Crude, tanks, (f.o.b. mill)	lb.	.09 –	.09¼
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08½ –	....
Summer yellow, bbl.	lb.	.12½ –	.13
Winter yellow, bbl.	lb.	.13½ –	.13½
Linseed oil, raw, car lots, bbl.	gal.	.94 –	.95
Raw, tank cars (dom.)	gal.	.88 –	.89
Boiled, cars, bbl. (dom.)	gal.	.96 –	.97
Olive oil, denatured, bbl.	gal.	1.10 –	1.12
Sulphur, (foots) bbl.	lb.	.08½ –	.08½
Palm, Lagos, casks	lb.	.07½ –	.07½
Niger casks	lb.	.07½ –	.07½
Palm kernel, bbl.	lb.	.08½ –	.09
Peanut oil, crude, tanks (mill)	lb.	.13 –	....
Peanut oil, refined, bbl.	lb.	.14½ –	....
Perilla, bbl.	lb.	.14½ –	.14¾
Rapeseed oil, refined, bbl.	gal.	.76 –	.76½
Rapeseed oil, blown, bbl.	gal.	.82 –	....
Sesame, bbl.	lb.	.12½ –	.12½
Soya bean (Manchurian), bbl.	lb.	.10½ –	....
Tank, f.o.b. Pacific coast	lb.	.09 –	....
Tank, (f.o.b. N.Y.)	lb.	.09¼ –	....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.65 –	$0.67
Menhaden, light pressed, bbl.	gal.	.60 –	....
White bleached, bbl.	gal.	.62 –	....
Blown, bbl.	gal.	.67 –	....
Crude, tanks (f.o.b. factory)	gal.	.47½ –	....
Whale No. 1 crude, tanks, coast	lb.	.... –	....
Winter, natural, bbl.	gal.	.76 –	.78
Winter, bleached bbl.	gal.	.79 –	.80

Oil Cake and Meal

Coconut cake, bags	ton	$30.00 –	$31.00
Copra, sun dried, bags, (c.i.f.)	lb.	.05¼ –	....
Sun dried Pacific coast	lb.	.04¼ –	....
Cottonseed meal, f.o.b. mills	ton	38.00 –	39.00
Linseed cake, bags	ton	38.00 –	....
Linseed meal, bags	ton	46.00 –	47.00

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.95 –	1.00
Cochneal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04 –	.04½
Cutch, Rangoon, bales	lb.	.15 –	.16
Dextrine, corn, bags 100 lb.		3.89 –	4.16
Dextrine gum, bags 100 lb.		4.19 –	4.46
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier com. cs	lb.	.09¼ –	.09½
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	80.00 –	85.00
Sumac, ground, bags	ton	$75.00 –	$80.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags 100 lb.		3.32 –	3.42
Tapioca flour, bags	lb.	.07 –	.07½

Extracts

Archil, conc., bbl.	lb.	$0.16½ –	$0.20
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.09 –	.09½
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.14 –	.15
Logwood, liq., 51°, bbl.	lb.	.07½ –	.08
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ –	.05
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, spot	lb.	$0.14 –	$0.18
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.50 –	.55
Prussian, bbl.	lb.	.50 –	.55
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl.	lb.	.30 –	.32
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.28 –	.30
Reds Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.20 –	1.25
Yellow, Chrome, C.P. bbls.	lb.	.17½ –	.18
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.26 –	$0.27
Beeswax, crude, Afr. bg.	lb.	.22 –	.22½
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.24 –	.24½
Carnauba, No. 1, bags	lb.	.36 –	.38
No. 2, North Country, bags	lb.	.24 –	.25
No. 3, North Country, bags	lb.	.16½ –	.17
Japan, cases	lb.	.17½ –	.17½
Montan, crude, bags	lb.	.05 –	....
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.04½ –	.04¾
Crude, scale 124-126 m.p. bags	lb.	.02½ –	.03
Ref., 118-120 m.p., bags	lb.	.03½ –	....
Ref., 125 m.p., bags	lb.	.03¾ –	....
Ref, 128-130 m.p., bags	lb.	.03¾ –	....
Ref., 133-135 m.p., bags	lb.	.04½ –	.04¾
Ref., 135-137 m.p., bags	lb.	.05½ –	.05¾
Stearic acid, agle pressed, bags	lb.	.12½ –	.12¾
Double pressed, bags	lb.	.13 –	.13½
Triple pressed, bags	lb.	.14½ –	.14¾

Fertilizers

Ammonium sulphate, bulk, f.o.b. works 100 lb.		$3.20 –	$3.25
F.a.s. double bags 100 lb.		3.40 –	3.50
Blood, dried, bulk	unit	4.40 –	4.60
Bone, raw, 3 and 50, ground	ton	28.00 –	30.00
Fish scrap, dom., dried, wks.	unit	.... –	....
Nitrate of soda, bags 100 lb.		2.40 –	2.52½
Tankage, high grade, f.o.b. Chicago	unit	3.25 –	3.35
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	4.00 –	4.50
Tennessee, 78-80%	ton	7.75 –	8.00
Potassium muriate, 80%, bags	ton	34.55 –	....
Potassium sulphate, bags basis 90%	ton	43.67 –	....
Double manure salt	ton	25.72 –	....
Kainit	ton	7.22 –	....

Crude Rubber

Para—Upriver fine	lb.	$0.25½ –	....
Upriver coarse	lb.	.21 –	....
Upriver caucho ball	lb.	.22 –	....
Plantation—First latex crepe	lb.	.27½ –	....
Ribbed smoked sheets	lb.	.27½ –	....
Brown crepe, thin, clean	lb.	.26 –	....
Amber crepe No. 1	lb.	.26½ –	....

Gums

Copal, Congo, amber, bags	lb.	$0.11 –	$0.18
East Indian, bold, bags	lb.	.22½ –	.23
Manila, pale, bags	lb.	.20 –	.20½
Pontinak, No. 1 bags	lb.	.20 –	.20½
Damar, Batavia, cases	lb.	.25 –	.25½
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.23 –	.23½
Kauri, No. 1, cases	lb	.66 –	.68
Ordinary chips, cases	lb.	.21 –	.23
Manjak, Barbados, bags	lb.	.09 –	.09½

Shellac

Shellac, orange fine, bags	lb.	$0.66 –	$0.67
Orange superfine, bags	lb.	.68 –	.69
A. C. garnet, bags	lb.	.65 –	....
Bleached, bonedry	lb.	.74 –	.75
Bleached, fresh	lb.	.62 –	.63
T. N., bags	lb.	.63 –	.64

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$375.00 –	$500.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	$55.00 –	$60.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 –	20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 –	15.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	28.00 –	....
Barytes, crude f.o.b. mines, bulk	net ton	8.00 –	10.00
Casein, bbl., tech.	lb.	.14½ –	.15½
China clay (kaolin) crude, f.o.b. Ga.	net ton	6.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	7.50 –	....
No. 2 pottery	long ton	6.00 –	....
No. 1 soap	long ton	8.50 –	....
No. 1 Canadian, f.o.b. mill	long ton	18.00 –	20.00
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06 –	.06½
Ceylon, chip, bbl.	lb.	.04½ –	.05
High grade amorphous crude	ton	15.00 –	30.00
Gum arabic, amber, sorts, bags	lb.	.14 –	.16
Gum tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.45 –	1.50
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N.Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl.	lb.	.05 –	.05½
Dom., ground, bbl.	lb.	.05½ –	.06
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50 –	5.00
Silica, amorphous, 250-mesh, f.o.b. Ill.	ton	17.00 –	17.50
Silica, glass sand, f.o.b. Ill.	ton	1.50 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	6.00 –	8.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 325 mesh, f.o.b. New York, bags	ton	14.75 –	15.25

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.50 –	2.75
Corning	bbl.	1.45 –	....
Cabell	bbl.	1.35 –	....
Somerset	bbl.	1.25 –	....
Illinois	bbl.	1.47 –	....
Indiana	bbl.	1.48 –	....
Kansas and Oklahoma, 28 deg.	bbl.	.70 –	....
California, 35 deg. and up	bbl.	.76 –	....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.18½ –	....
Naphtha, V. M. & P. deod, steel bbls.	gal	.17½ –	....
Kerosene, ref. tank wagon	gal.	.14 –	....
Bulk, W.W. delivered, N.Y.	gal.	.06 –	....
Lubricating oils:			
Cylinder, Penn., dark	gal.	.22½ –	....
Bloomless, 30@31 grav.	gal.	.17½ –	....
Paraffin, pale	gal.	.16 –	.17
Spindle, 200, pale	gal.	.20 –	.20½
Petrolatum, amber, bbls.	lb.	.03½ –	.04
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–145
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	45–48
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	38–42
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	53–55
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	53–54
F.o.b. Mt. Union, Pa.	1,000	45–47
Silicon carbide refract. brick, 9-in.	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 1-2% C	lb.	.28 –	.30
4-6% C	lb.	.12 –	....
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	110.00 –	....
Spiegeleisen, 19-21% Mn.	gr. ton	45.00 –	47.00
Ferromolybdenum, 50-60% Mo, per lb. Mo.	lb.	2.00 –	2.50
Ferrosilicon, 10-12%	gr. ton	43.00 –	50.00
50%	gr. ton	85.00 –	....

Ferrotungsten, 70–80%, per lb. of W	lb.	$0.88 @ $0.95
Ferro-uranium, 35-50% of U. per lb. of U	lb.	4.50 – ....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 – 4.50

Ores and Semi-finished Products

Bauxite, dom. crushed dried, f.o.b. shipping points	ton	$5.50 – $8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 – 23.00
C.i.f. Atlantic seaboard	ton	21.00 – 25.00
Coke, fdry., f.o.b. ovens	ton	5.00 – 5.50
Coke, furnace, f.o.b. ovens	ton	4.00 – 4.25
Fluorspar, gravel, f.o.b. mines' Illinois	ton	23.50 –.....
Ilmenite, 52% TiO_2	lb.	.01½– .01¾
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.40 –.....
Manganese ore, chemical (MnO_2)	ton	75.00 – 80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.75 –.....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 – .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½– .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½– .12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –.....
Rutile, 95% TiO_2	lb.	.12 –.....
Tungsten, scheelite, 60% WO_3 and over	unit	9.50 – 10.00
Tungsten, wolframite, 60% WO_3	unit	8.75 – 9.00
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 – 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 – 2.50
Vanadium pentoxide, 99%	lb.	12.00 – 14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 – 1.00
Zircon	ton	50.00 –.....

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	12¼
Aluminum, 98 to 99%	25–27
Antimony, wholesale, Chinese and Japanese	7½– 7¾
Nickel, virgin metal	27–29
Nickel, ingot and shot	30–32
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	41.50
Lead, New York, spot	6.85
Lead, E. St. Louis, spot	6.65
Zinc, spot, New York	6.65
Zinc, spot, E. St. Louis	6.30

Other Metals

Silver (commercial)	oz.	$0.63¾
Cadmium	lb.	.88@ .90
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25–.....
Platinum	oz.	116.00
Iridium	oz.	275.00@300.00
Palladium	oz.	80.00
Mercury	75 lb.	61.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	19.50
Copper bottoms	29.75
Copper rods	19 75
High brass wire	18.50
High brass rods	16.25
Low brass wire	20.25
Low brass rods	20.50
Brazed brass tubing	23.50
Brazed bronze tubing	27.00
Seamless copper tubing	25.50
Seamless high brass tubing	24.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	9.00@ 9.25
Copper, heavy and wire	11.00@11.25
Copper, light and bottoms	10.00@10.25
Lead, heavy	5.50@ 5.62½
Lead, tea	3.50@ 3.75
Brass, heavy	6.25@ 6.50
Brass, light	5.25@ 5.50
No. 1 yellow brass turnings	6.00@ 6.25
Zinc scrap	3.75@ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Sft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3.64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

GADSDEN—The Coosa Pipe & Foundry Co. has preliminary plans under consideration for the construction of an addition to its plant for the production of cast-iron pipe and other iron castings. It is purposed to secure additional land in the vicinity of the present works. Otto Agricola heads the company.

California

SAN FRANCISCO — The Great Western Smelting & Refining Co., 75 Folsom St., has awarded a general contract to the Hayes-Oser Co., Call Bldg., for the erection of its proposed 1-story plant addition, 137x275 ft., to be used as a foundry and for other service, estimated to cost $70,000. Morrow & Garren, Chronicle Bldg., are architects.

CUDAHY—The National Paper Products Co., a subsidiary of the Zellerbach Paper Co., 534 Battery St., San Francisco, and Los Angeles, has purchased a tract of property here, bounded by Santa Ana and Independence Ave., and Otis St., totaling about 25 acres, as a site for a new paper mill, for which plans will be prepared at once. It will consist of a number of buildings, including main mill, power house, machine shop and auxiliary structures, estimated to cost close to $2,000,000, with machinery.

SAUSALITO—The Mason Distillery Co. has tentative plans for the rebuilding of the portion of its industrial alcohol plant, destroyed by fire, Sept. 25, with loss approximating $100,000, including equipment. The company utilizes waste material from the sugar refineries in this district for production.

FRESNO—The Independent Paper Stock Co., 3035 Butler St., has awarded a general contract to the K. E. Parker Co., Clunie Bldg., San Francisco, for the erection of a new 1-story plant, estimated to cost $50,000, for which ground will be broken at once.

OAKLAND — The Pacific Enameling & Mfg. Co., 880 60th St., has plans for the construction of a new 1-story plant to cost approximately $12,000.

Connecticut

HARTFORD — The Hartford Tissue Mills, Inc., recently organized, will take over and operate the plant of the Burnside Tissue Paper Mills, Inc., East Hartford, bankrupt, recently acquired by Charles Boyland and associates for a consideration of about $125,000. The new owner will take possession immediately and plans for improvements; it is purposed to increase the capacity. Mr. Boyland heads the new company.

Florida

TAMPA—The United States Export Chemical Corp., recently formed, has perfected details of its organization and will soon commence the construction of its proposed local plant for the production of superphosphates for fertilizer service. The site is on the Alafia River and the plant will consist of a number of buildings, estimated to cost more than $125,000, with equipment. Lorenzo A. Wilson, president of the Wilson & Toomer Fertilizer Co., Jacksonville, Fla., is prominent in the new company. Harry L. Pierce is vice-president.

TAMPA—The Perry Paint & Glass Co. has commenced the erection of a new local plant for the manufacture of paints, oils and kindred products. It is purposed to install equipment and commence production at an early date.

Illinois

ANNA—A. A. Fasig, Anna, and associates, are perfecting plans for the construction of a new cement-manufacturing plant on local site, to consist of a number of buildings, estimated to cost in excess of $500,000, with equipment. The initial mill will be equipped for a monthly output of about 85,000 bbl. It is purposed to organize a company to operate the mill.

Indiana

INDIANAPOLIS — The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron sanitary ware, has acquired property at Pratt St. and Senate Ave., 162x204 ft., as a site for a new 2-story factory branch, estimated to cost $150,000, for which plans will be prepared at an early date.

JEFFERSONVILLE—Colgate & Co., 105 Hudson St., Jersey City, N. J., plans converting the old Indiana Reformatory building into a soap factory at a cost of $100,000.

Kentucky

ASHLAND—The Kentucky Face Brick Co., Second National Bank Bldg., recently formed with a capital of $500,000, has tentative plans under consideration for the erection of a new local plant for the manufacture of face brick, tile and kindred products. A power plant will be constructed. The initial works are estimated to cost $150,000, with equipment. A. J. Russell is secretary.

LOUISVILLE—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron sanitary ware, vitreous china, etc., has plans in preparation for the erection of an addition to its local plant at Shipp and 6th Sts., to be 1-story, 65x225 ft., and equipped for enameling operations. It is estimated to cost approximately $75,000. Fred Erhard, Norton Bldg., Louisville, is architect.

Louisiana

VACHERIE—The Vacherie Sugar Co., Inc., has commenced the installation of additional equipment at its local mill, including crusher machinery, engine and auxiliary equipment. Extensive operations are planned.

Maryland

BALTIMORE — The Porcelain Enamel & Mfg. Co. is pushing construction on its new plant at 23rd St. and Eastern Ave., replacing its works destroyed by fire a number of months ago, and plans to begin production at an early date. Increased capacity will be provided over the former works. Ground has been broken for a new office building to cost approximately $50,000.

Michigan

KALAMAZOO—The Valley Paper Co. has commissioned Billingham & Cobb, 402 Press Bldg., engineers, to prepare plans for its proposed new paper mill on local site, to consist of a number of structures, 2- and 5-story, to cost in excess of $700,000, instead of $150,000, as previously announced. It is purposed to call for bids at an early date. The company was organized recently with George O. Comfort as president.

GRAND RAPIDS—The Certain-Teed Products Corp., 100 East 42nd St., New York, has commenced foundations for a new 2-story plant in the Beverly section, for the manufacture of cement plaster. It is estimated to cost in excess of $175,000, including equipment. George M. Brown is president.

Minnesota

EAST GRAND FORKS—The Minnesota Sugar Co., 811 Metropolitan Bank Bldg., Minneapolis, H. A. Douglas, president, has tentative plans under advisement for the construction of a new beet sugar refining plant, estimated to cost close to $450,000, with equipment. It is purposed to commence work during the coming year.

ST. PAUL—The Ford Motor Co., St. Paul, and Highland Park, Mich., is having plans prepared by A. Kahn, 1000 Marquette Bldg., Detroit, Mich., and Stone & Webster, 147 Milk St., Boston, Mass., for a 1-story automobile plant to be 600x1796 ft.

Mississippi

LEXINGTON—The Lexington Oil Mill Co., recently organized, will take over and operate a local plant, and plans for extensions and improvements for increased

capacity. W. B. Potts, Kosciusko, Miss., is president of the new company; G. S. Bealle, Jr., is secretary.

Montana

BUTTE—The Catholic Association of Butte plans for the installation of a chemical laboratory in its new 3-story high school, for which plans are being completed.

Nevada

FALLON—The Consolidated Independent Sugar Corp. of Utah, Salt Lake City, has acquired the mill of the Fallon Beet Sugar Factory and will take possession at an early date. Plans are under way for operation, to include improvements and extensions for greater output. The purchasing company also operates mills at Hooper, Utah, and at Rigby, Idaho.

New Jersey

BAYONNE—The Baker Castor Oil Co., Ave. A and 2nd St., has tentative plans for the rebuilding of the portion of its plant, destroyed by fire, Sept. 27, with loss reported in excess of $65,000.

BOONTON—Fire, Sept. 29, destroyed a building at the plant of the Boonton Rubber Co., Fanny Road, with loss estimated at $23,000. It is proposed to rebuild.

GARFIELD—The Meeley Tire & Rubber Co. has taken over the local plant of the Armstrong Rubber Co., recently acquired, and plans for extensive production in the line of tires and tubes; it is purposed to develop an output of about 2,500 tires a day at an early date. George H. Meeley heads the company.

GLOUCESTER—Fire, Sept. 28, destroyed a building, 50x150 ft., at the local plant of the Hinde & Dauch Paper Co., with loss reported at $17,000. Headquarters of the company are at Akron, Ohio.

New York

ROCHESTER—R. G. Strasenburgh & Co., 105 Exchange St., manufacturer of chemical products, has plans for the erection of a new 4-story addition at Exchange and Troup Sts., estimated to cost close to $65,000. It is purposed to break ground at once.

JEWETTVILLE—The Jewettville Clay Products, Orchard Park, has preliminary plans under way for the rebuilding of the portion of its 3-story plant, destroyed by fire, Oct. 1, with loss estimated at close to $100,000, including equipment.

HUDSON—The Hoboken Paper Mill, Inc., 151 5th Ave., New York, is reported to be planning for the rebuilding of its plant at Goulds Station, near Hudson, recently partially destroyed by fire. The reconstruction, with new equipment, is estimated to cost $250,000.

Ohio

WOOSTER—The Thomas Rubber Co., Millersburg, Ohio, has acquired the local plant of the Kelly-Springfield Tire Co., for a consideration said to be $100,000. The plant has a rated output of 500 tires per day. The new owner plans to take early possession and will make a number of improvements. The plant has been idle for a number of months past.

DAYTON—The Elam Paper Co., Marion, Ind., is planning for the establishment of a large local plant for the manufacture of paper products, and purposes to remove its present works to the new location, with installation of additional equipment for extensive increase in production. The company was reorganized recently with a capital of $1,100,000, for general expansion.

Oklahoma

BLACKWELL—The Hazel-Atlas Glass Co., Wheeling, W. Va., will commence the construction of the proposed additions to its local plant, estimated to cost $100,000. The work will consist of a new building, 100x180 ft., and power house, 65x100 ft.

Pennsylvania

OIL CITY—The Penn-American Refining Co. has commenced an improvement and expansion program at its plant to cost more than $250,000. The present oil refinery will be remodeled and additional stills and other equipment installed; a four-still cracking plant for gasoline refining will be built, as well as a new electric plant and steam boiler house.

LINFIELD—Fire, Oct. 4, destroyed a portion of the fertilizer plant and feed milling works of Jacob Trinley & Son, with loss estimated at $50,000, including machinery. It is planned to rebuild.

JOHNSTOWN—The Savage Fire Brick Co., F. W. Minch, secretary and treasurer, is perfecting plans for the construction of a new plant at Keystone Junction, near Meyersdale, Pa., for the manufacture of firebrick and refractory shapes, to replace its plant at this location, destroyed by fire a number of years ago. The company is also planning for the erection of additions to its present plants at Hyndman and Williams, Pa., for extensive increase in capacity. The new Keystone works will be equipped for an output of about 60,000 firebricks per day.

Texas

PARKS—The Coltexo Corp., recently organized under Delaware laws with a capital of $1,000,000, will be operated jointly by the Texas Co., Dallas, Tex., and the Columbian Carbon Co., Williamsport, Pa. The new organization will specialize in the production of carbon black and in gasoline refining by natural gas process, and will take over an established local plant. Plans are under consideration for extensive operations, to include the construction of new plants in different localities, including properties held by the parent companies in Louisiana.

Utah

SALT LAKE CITY—The Republic Creosoting Co., Hammond Bldg., Detroit, Mich., is perfecting plans for the construction of a new plant for the production of creosote in Utah County, in the vicinity of the coke works of the Columbia Steel Co., with which a contract has been made for the coal tar byproduct from the coke ovens for a period of years. The initial works will be equipped for an output of close to 10,000 gals. per day, and will be supplemented with a second unit at an early date, with similar capacity.

Washington

SPOKANE—The Federal Match Co., recently formed as a consolidation of a number of companies in this line, will take over and operate the local plant of the Union Match Co., East Sprague Ave. Plans are under way for the construction of an addition, to double the present capacity. Paul G. Oettel is local manager.

West Virginia

KEYSER—The Potomac Pottery Co., manufacturer of sanitary ware, will commence the construction of a new addition, 35x125 ft., to double the present capacity. Three additional kilns will be built and considerable equipment installed.

New Companies

LIBERTY CHEMICAL & SUPPLY CO., 332 South La Salle St., Chicago, Ill.; chemicals and kindred products; $10,000. Incorporators: Benjamin J. Bernasek and William F. Steep.

MAGNESITE CARBONATE CO., Newark, N. J.; magnesite cement products, etc.; $275,000. Incorporators: Samuel Friedman, J. Harry O'Brien and T. A. Curtin. Representative: John J. Fallon, 53 Newark St., Newark.

GREENVILLE COTTON OIL MILLS, INC., Greenville, S. C.; cottonseed oil products; $100,000. J. J. Lawton is president and treasurer, and E. B. Lawton secretary, both of Greenville.

UNIVERSAL CHEMICAL CO., Augusta, Me.; chemicals and chemical byproducts; 1,000 shares of stock, no par value. E. M. Leavitt is president and treasurer, and Frank E. Southard, Augusta, clerk and representative.

WISSMAN OIL CORP., New York, N. Y.; petroleum products; $100,000. D. S. Meister, 1929 84th St., Brooklyn, N. Y., is the principal incorporator.

EXCELSIOR CHEMICAL CO., San Francisco, Calif.; chemicals and chemical byproducts; $100,000. Incorporators: O. W. Glauser, Emil Leuenberger and E. R. Tucker, all of San Francisco.

ARKAYAR RUBBER PRODUCTS CORP., Boston, Mass.; rubber products; $10,000. Clarence K. Reiman is president; Charles B. Russell, vice-president; Richard G. Knowland, Quincy, Mass., treasurer.

RADIUM COMPOUNDS CORP., 1601 West Chicago Ave., Chicago, Ill.; radium compounds, chemical products, etc.; $50,000. Incorporators: T. E. V. Curran and Vincent C. Daniels.

CRESCENT MFG. CO., Wilmington, Del.; leather products; $25,000. Representative: Corporation Trust Co. of America, du Pont Building, Wilmington.

CROTHERSVILLE CLAY PRODUCTS CO., Crothersville, Ind.; tile and other burned clay wares; $10,000. Incorporators: Clyde Cravens, James Ritz and Edward Krause, all of Crothersville.

AQUASEAL, INC., Newark, N. J.; chemicals and chemical byproducts; $125,000. Incorporators: Richard Shippen, Ludwig M. and Francis L. Dieterich, 518 Broad St., Newark. The last noted is representative.

SOUTHERN ALCOHOL & DENATURING CO., Lacoma and Manakin Sts., Baltimore, Md.; industrial alcohol products; $250,000. Incorporators: Walter Goldstein and Robert Simpson.

P. H. T. CORP., Portland, Me.; chemicals, oils, varnishes, etc.; $10,000. Joseph N. Goodman is president, and Leo A. Goodman treasurer. Representative: Israel Bernstein, Portland.

JOHN D. ROBNETT & SONS, INC., 4403 South La Salle St., Chicago, Ill.; soaps, soap powders, etc.; $25,000. Incorporators: M. B. Becker, John D. Robnett and George R. Kent.

MICHIGAN LIME & FERTILIZER CO., Jackson, Mich.; fertilizers, lime and allied products; $200,000. Incorporators: Henry W. Berger and Charles P. Berger, Jackson; and N. S. Potter, Jr., Annberay Apartments, Ann Arbor, Mich. The last noted is representative.

ELK PETROLEUM CO., Wilmington, Del.; refined petroleum products; $1,000,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

SAFETY MFG. CO., INC., 188 Bergen Ave., Jersey City, N. J.; chemicals and chemical byproducts; 1,000 shares of stock, no par value. Incororators: F. A. Wardell, Benjamin C. Hill and Milton L. Chapman.

AMERICAN SULPHUR & FERTILIZER CO., Dallas, Tex.; fertilizer products, sulphur, etc.; $500,000. Incorporators: A. Y. Yarborough and J. A. Price, Dallas.

SOUTHERN CALIFORNIA SILICA & SPAR CO., Los Angeles, Calif.; operate silica and feldspar properties and commercial reduction plants; $75,000. Incorporators: Kenneth C. Kuencer, O. E. Custer, and George E. Fickett, all of Los Angeles.

CEMENT PRODUCTS CORP., Elizabeth, N. J.; cement blocks and other products; $125,000. Incorporators: Thomas N. Manion and Rufus I. Brown. Representative: Forrest C. Abrew, Jersey and Front Sts., Elizabeth.

BLUE BELT FERTILIZER CO., Savannah, Ga.; fertilizer products; $50,000. Incorporators: W. A. Smith, C. E. Daniels, both of Savannah.

NATIONAL PETROLEUM CORP., Moundsville, W. Va.; petroleum products; $125,000. E. L. Hadley, president, and A. C. Moser, secretary and treasurer, both of Mounsville.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

PAINTS, STAINS, VARNISHES AND OILS. Matamoros, Mexico. Purchase.—7919.

PIGMENTS for coloring lead pencils, such as dry colors, gold leaf, bronze, gilt and aluminum powder. Copenhagen, Denmark. Purchase.—7937.

SULPHATE OF AMMONIA, chemicals and rosin. Soerabaya, Java. Exclusive agency.—7914.

SULPHUR DIOXIDE. Basse-Terre, Guadeloupe. Purchase.—7891.

TANNING MATERIALS and Chemicals. Antwerp, Belgium. Agency.—7889.

OIL, Coconut and Oleo. Galata, Turkey. Agency.—7924.

OILS, Vegetable and Animal, not including linseed oil. Antwerp, Belgium. Agency.—7889.

LUBRICATING OILS, 2,500 gal. monthly. Nantes, France. Agency.—7908.

PERFUMERY and chemists' sundries. Johannesburg, South Africa. Agency.—7916.

PLANT for manufacture of CO_2 gas. Lourenco, Marques, Portuguese East Africa. Purchase.—7905.

CELLULOID and galalith in sheets and bars. Sao Paulo, Brazil. Purchase.—7923.